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NOTICES.

All communications relative to the editing of the JOURNAL OF GAS LIGHTING, and orders for Advertisements, to be addressed to the Editor and Proprietor, THOMAS G. BARLOW, Civil Engineer, 32, Bucklersbury, London.

The present Number is forwarded to the Chairman and Directors, Secretary and Engineer, of every Gas Company in the United Kingdom, whose names and addresses we have been able to obtain; and such of them as are desirous of receiving the publication regularly are requested to give orders to that effect to their Booksellers or News Agents; or to William Strange, 21, Paternoster-row, London.

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The Editor will be particularly obliged by his friends forwarding to him Notices of all Meetings, Trials, or Appeals which it may be interesting to the Gas World to have reported.

Circular to Gas Companies.

The shareholders in metropolitan gas companies seem quite panicstruck, if we are to judge from the continued fall in the value of their shares at the Stock Exchange, as the following quotations of prices from "Crosley's Share Lists" of January, 1848, and January, 1849, will show :—

	1848.	1849.
British	£16 to 17	£13 to 15
Chartered	58 to 59	48 to 49
City of London	285 to 290	240 to 245
Equitable	38 to 39	33 to 35
Imperial	80 to 84	62 to 64
Phœnix	35½ to 36½	28 to 30
Poplar	30 to 35	28 to 30
Ratcliff	78 to 80	72 to 74
South Metropolitan	28 to 30	21 to 23

the average fall being nearly 20 per cent.

How much of this is due to the mania for cheap gas, or how much to the dread of the electric light, it is scarcely worth while inquiring; but the great fact is before us, that a depreciation to the extent of upwards of half a million of money has taken place in the market value of this property, and it seems to be daily augmenting.

We have devoted a considerable space in our present number to a minute description of the apparatus used for the production of what is improperly called the electric light. A writer in a popular journal thus notices the specification, and our own experience confirms it :—

"The specification of this patent is at length finished; and a careful perusal of the document affords matter for grave consideration, as, unfortunately, it is but a sample of the numerous specifications of absolute impossibilities which, we are afraid, too frequently exist amongst the parchments of the Enrolment-office.

"In our former notices of the electric light we showed that success or failure would depend upon the cost of the production of the voltaic power; therefore we shall confine our attention to those parts of the specification which appertain to its economic production.

"'To economize the products, when zinc is employed, I add (says the patentee), in a separate vessel, to the solution of sulphate of zinc a solution of sesquicarbonate of ammonia, which precipitates the oxide of zinc metal and releases the acid, which may be used again.' Our readers, doubtless, will think that there is some mistake in this paragraph—that it is either misquoted or misprinted; but we regret to state that it actually exists in the patent. We need hardly state that every schoolboy where chemistry is taught knows that it would be impracticable to set free sulphuric acid by such means. Again, the patentee speaks of using platinized plates of lead, or other metal, as the source of power. Now, the effect of adding platinum to the lead, or other metal, would be to increase local action, which would not in any manner contribute to the general power of the battery. Lead, moreover, as a positive pole, gives rise to a current of but very feeble intensity, and one, perhaps, quite inapplicable for the evolution of light.

"In the specification a considerable space is dedicated to the description of a perfluent battery, where the exciting fluid passes from cell to cell. This arrangement is, perhaps, the very worst which could possibly be adopted by the electrician for a compound battery, as every cell would possess a fluid of different exciting power; and the terminal cells, if his intentions were carried out, would become precipitating-troughs instead of battery-cells, a state which the electrician always carefully prevents.

"For the generation of voltaic power, or its economic production, we regret to state that there is not one single addition to our stock of knowledge; but, throughout, the patent contains statements in direct violation of electrical and chemical laws. All hope of an extensive application of the electric light must now be abandoned; but still we shall rejoice if it can be employed as a special mode of illumination on great public occasions."

The cry for "cheap gas" in the metropolis is not so easily disposed of; and our position as independent observers of the temper and spirit of the times gives us greater opportunities for judging of the gravity of the question than those engaged either in raising the storm, or attempting to resist its violence.

We are not, therefore, without some fears that, unless the movement be checked by prudent and comprehensive measures, the result may be a serious permanent injury to the public, as well as to the owners of metropolitan gas property. The useless expenditure of capital in new competing works, destined at no remote period to be united in friendly alliance of interest with those establishments they were intended to destroy, has, in our opinion, inflicted a far more serious injury on the public at large than is compensated by the benefit they have derived from the anticipation, by a few years, of reductions in the price of gas, which most of the old companies were disposed to make as their means allowed. We believe that, during the last twenty years, more than a million has been squandered in this manner, on which the consumer must now pay interest in one shape or the other.

The pamphlets and prospectuses of both the contending parties are entirely deficient of proofs in support of their respective views. "The Plain Statement of a Director of the City Gas Company" does not, indeed, attempt to say that 6*s*. per thousand cubic feet is the lowest price at which they can now afford to sell gas; nor do the Consumers' Company instance any place where it *has* been sold at 4*s*. to yield a profit. These subjects are, we presume, reserved for a par-

liamentary investigation, at a cost to the consumer of gas, and for the benfit of the legal and engineering professions, to the extent of £100,000 and upwards.

Some years of observation and reflection on this subject have convinced us that the whole system upon which the lighting of the metropolis is now organized is vicious, and that, if not modified, the evils will go on increasing. The works now in existence are competent, by a judicious rearrangement of their main pipes, to the distribution of 50 per cent. more gas than there is at present any demand for; and one quarter of the amount which it is proposed to expend in organizing a new establishment for the City alone will provide the means for augmenting by one-half both the production and distribution of gas throughout the entire metropolis; but, while there are so many conflicting interests under the present system, we nearly despair of seeing any departure from the usual experience of late years. The new comers will be glad to make terms with their older rivals, and in a few months the public will find themselves worse off than they were before they were induced to admit competition into their district. The parishioners of St. Pancras parish can give some practical information of this score.

Our remedy for all these evils is the amalgamation of the existing metropolitan gas companies in one "United Metropolitan Gas Company," upon the basis of five-years' purchase of their gross gas rentals for the year 1848; or, in other words, that for each £1000 of gross rental, the respective companies shall receive £5000 stock in the amalgamated one, (subject to such deductions as may be necessary for the enfranchisement of copyholds and leaseholds, and for dilapidations); also stock at par for all their available assets in book debts and stock in trade, each company liquidating its own engagements. We had at first thought of proposing the *market* value of the shares as the basis of the amalgamation; but this would be evidently unjust to some companies, whose shares are from temporary causes quoted below their real value. The principle we have adopted may, we believe, be applied without prejudice in all cases except that of the Western Gas Company, which, not being as yet in operation, has no rental on which to found a calculation; we apprehend however, that an arbitration would not be objected to by the shareholders of that company, whose prospects at the present moment are not very flattering. The suburban districts of Brentford and Tottenham are too remote and scattered for incorporation in the metropolitan combination, and we, therefore, see no advantage in embracing them in our scheme.

The amalgamation must, of course, be submitted to Parliament for its sanction. Public opinion will, doubtless, require that in the bill a clause be introduced limiting the price of gas to 5s. per thousand feet, of a certain specified standard quality; and we conceive there is no danger in admitting this, provided it shall be made compulsory to charge equal rates to both the public and private consumers; we even see no risk in submitting to a further slight reduction in the maximum price every five years, till 4s. per thousand feet is attained. The dividend should also be limited to 6 per cent. on the share capital, and the audited accounts should be laid before the Commissioners of Woods and Forests, and be open to the inspection of parochial authorities.

The affairs of the amalgamated company should be directed by a board, consisting of thirty-seven members, organized as follows:—Twenty-four members to be first named by the shareholders of the existing companies, viz.:—

2	By the	British Gas	Company.
3	,,	Chartered	,,
2	,,	City of London	,,
2	,,	Equitable	,,
3	,,	Imperial	,,
2	,,	Independent	,,
2	,,	London	,,
2	,,	Phœnix	,,
1	,,	South Metropolitan	,,
1	,,	Commercial	,,
1	,,	Deptford	,,
1	,,	Poplar	,,
1	,,	Ratcliff	,,
1	,,	Western	,,

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To these a liberal sum should be allotted per annum, a portion to be divided according to their attendances; the present system of re-election at stated periods being followed.

Six paid directors, with liberal salaries, should be selected by the above-named twenty-four, from among the most intelligent Engineers and Secretaries of the existing companies, and all future vacancies should be filled up from among those having ten years' standing in the same body.

Six Official Directors, with liberal salaries, two being named by the Court of Common Council, and four by the Commissioners of Woods and Forests, and all removable at their pleasure. No shareholder in the amalgamated company, nor any one having been a shareholder in the existing companies during the last five years, should be eligible for this office.

The thirty-six directors to appoint a Chairman. The presence of three paid directors and three official directors to be requisite at all meetings of the general board, and one of each at all sub-committees or local board meetings. The consent of four of the official directors should be obtained before any advance can be made in the price of gas, after it has been reduced below 5s. per thousand cubic feet. The general board to be subdivided into six local boards; the metropolis being also divided into as many districts, viz.:—

The City and Finsbury district,
,, Westminster ,,
,, Eastern ,,
,, Southern ,,
,, North-Western ,,
,, South-Eastern ,,

A paid and official director should be assigned to each district, with a district engineer and secretary, the general operations of the whole of the establishments being under the direction of an engineer in chief.

One of the smaller stations might be appropriated to the trial of all new inventions and improvements in the manufacture of gas, under the inspection of an "experimental committee," composed of paid and official directors, the results being reported to the general board, and copies of all such reports being given to the inventors. This measure would ensure to the scheme of every sanguine projector a fair trial, and its real value would be thus impartially ascertained.

It is our firm belief that by this combination economies may be introduced in the production and distribution of gas which no other system can effect. In the direction, administration, inspection, and collection, an immediate saving is at once made. Such works as render the neighbourhood insalubrious, or from their locality cause unnecessary expense in the manufacture of gas, may be suppressed and converted into gasholder stations, and the production transferred to more appropriate localities. Nearly every street having double series of main pipes laid through them need have only one charged with gas in the daytime; the leakage on the other line is, therefore, materially reduced; and, calculating this saving only at 5 per cent. on the total quantity of gas made (which is a very moderate calculation), it would represent a money value of about £30,000 per annum.

The experiment has been partially tried at Liverpool, and neither shareholders nor consumers have had cause to be dissatisfied with the result. The proprietors have regularly received 5 per cent. interest on their capital, and their shares have uniformly borne a premium. The public have been supplied with good gas at 4s. 6d. per thousand feet, and, had the company been limited to a 6 per cent. dividend, a further reduction would in all probability soon take place.

We have not the vanity to suppose that our project is perfect, but we fearlessly maintain that, by a compromise on the basis we present, the interests of the shareholders will be amply protected, and, whilst they will be secure from further loss, they may safely hold a property subject to as little fluctuation as the public funds, and yielding as good interest as can be expected from investments of this nature; on the other hand, by the introduction of such popular elements as we propose, in the official directors, the public and the consumers will be protected from the abuse of large powers entrusted to a powerful body, responsible to shareholders alone. We, in fact, combine all the advantages of the Manchester system without any of its risks. The initiation must come from the companies themselves; we trust they will take our suggestions into their serious and immediate consideration, and shall be gratified to hear that the project is entertained.*

* The above has been written in entire ignorance of a circular

To no other city of the empire is the scheme which we advocate for the metropolis applicable, as no other city presents the same opportunities for beneficially uniting the many conflicting interests, and converting them into a public benefit. We therefore crave pardon of our provincial readers for having dilated at such length on a subject to them so uninteresting, but the magnitude of the interests involved will, we trust, be deemed a sufficient excuse.

Directors of gas companies will do well to give their support to the present movement of the railway interest, the object of which is to obtain the sanction of the Legislature to a more equitable system of rating railway property than now exists. It seems monstrous that railways, gas works, and water works, which impose but slight burdens on parochial funds, should be forced, by what we conceive to be a strained interpretation of the law, to contribute to them so heavily, and upon principles which, if applied to private establishments, would be deemed oppressive and unjust. We shall take an early opportunity of noticing at length a pamphlet entitled "The Principles and Law of Rating Railway, Gas, Water, and similar Companies, by C. Penfold, Surveyor," in which the obnoxious system is sustained. In the meantime we recommend that the following petition, which is moulded on the railway one, be prepared and presented to Parliament by all companies who feel themselves aggrieved :—

To the Honourable the Commons of the United Kingdom of Great Britain and Ireland in Parliament Assembled.

The humble Petition of the Company, agreed to at a general meeting of their company, held at

Sheweth,—That the present system of rating gas works to poor, highway, church, and other local rates, is unequal, unjust, and oppressive.

That *profits of trade* are not legally rateable, yet, according to the mode adopted by the courts of law to ascertain the rateable value of gas works, the *profits* of a gas company are virtually rated.

That gas works derive little or no benefit from the expenditure of the rate, and occasion, practically, no influx of poor into, or expenditure by, the parish, yet they bear, under the existing law, an undue proportion of the rates, compared with other property in the parish.

That it is inexpedient and against public policy to tax unduly the enterprise by which improvements are effected.

That under these circumstances an alteration of the law, which shall render more just and equal the local taxation upon property invested in gas works, is imperatively necessary.

That your petitioners have been informed that a bill is about to be introduced into your Honourable House to remedy the grievances above complained of, so far as railways are concerned, and they pray that gas works may be included therein.

Your petitioners, therefore, humbly pray your Honourable House that the said bill may pass into a law, and that your petitioners may have such further relief in the premises as the justice of the case may seem to require.

And your petitioners will ever pray, &c.

We are desirous of calling the attention of our readers to an instrument called the "Gas Light Monitor," which has been recently patented; its object being to remedy an inconvenience universally felt and complained of, viz., the smoking of gas lights when under too great a pressure. The apparatus is attached immediately below or to the side of the gas-burner, forming, in fact, a continuation of its stem; and consists of a chamber containing a disc of thin metal; this chamber is so constructed as to cause the disc to be acted on by the pressure of the gas, and, by a movement perfectly simple and unfailing, to allow the passage of nearly an equal quantity of gas, be the pressure great or small. The effect of this is, that under high pressure the flow of gas is restrained, and prevented from passing to the burner in such quantity as shall cause inconvenience, waste, or danger from the undue height or size of flame; while at low pressure, the gas being allowed free passage by the different position of the disc, an adequate supply is secured. The advantages afforded by the use of the apparatus with reference to economy and safety must be self-evident, and, as it can be adapted at the trifling expense of 3s. 6d., or 4s. to any burner, there appears to be no reason why it should not be very generally applied, more especially to public lights in elevated situations, where the maintenance of an equal pressure not exceeding $\frac{6}{10}$ths would cause an immense saving to gas companies.

The "Economic Gas Cooking Stove," lately registered by Mr. Ricketts, is a valuable addition to his other ingenious inventions for increasing the utility and promoting the consumption of gas. At a cost of less than three farthings per hour (gas being 6s. per thousand feet) a large family can provide themselves with fuel for roasting, boiling, stewing, and broiling, at all hours, without the waste of having to maintain a large coal fire constantly burning, as the gas can be lighted at a moment's notice, and extinguished when the operation is concluded. We hope at no distant time to see a gas cooking stove and gas fittings as landlords' fixtures in the humble dwellings of the working population of our cities and towns, as well as contributing to the comforts of the mansions of the rich.

The Metal Market has been firmer during the last ten days than it was at the end of January, about which period large contracts for remelted retorts were made below £5 per ton, delivered in London. The founders and manufacturers of gas apparatus are generally in want of orders, and they may be placed on terms advantageous to the purchaser.

P.S.—The Commissioners of Sewers for the City of London have come to the following resolution, by a majority of nineteen to seven, on the proposed bill to give them the power of purchasing the main pipes of the several gas companies who light the City :—

"That no further proceedings be taken in prosecuting this bill, and that it be referred to the Board of Health to prepare a report to be presented to the Court of Common Council explaining the grounds upon which we have come to such resolution; and that the General Purposes Committee be instructed to inquire and report as to the best means of effecting a reduction in the price of gas to the citizens of London."

The proposition appeared to us from the commencement to be too absurd and unjustifiable to admit of any other solution. The way is thus cleared for the consideration of the various means of effecting a reduction in the price of gas on rational and feasible grounds; and we shall not fail to urge our views in the proper quarter.

which we understand has been addressed to the metropolitan companies, and of which a copy was handed to us at the moment of our going to press.—Ed.

Communicated Articles.

ON THE COMPARATIVE VALUE OF COAL FOR THE PURPOSE OF ILLUMINATION.

BY DR. A. FYFE, F.R.S.E., F.R.S.S.A., PROFESSOR OF CHEMISTRY, KING'S COLLEGE UNIVERSITY, ABERDEEN.

In a paper published in the transactions of the Royal Scottish Society of Arts, for 1842, I gave an account of numerous trials made with the view of ascertaining the value of different kinds of coal for the purposes of illumination. Having been again engaged in conducting experiments for the same purpose, I have been induced to make some of the results public, because I conceive that they are interesting, and lead to valuable practical applications.

The objects which I have had in view were to ascertain, not only the *comparative amount of light* afforded by the gases which the coals yield, but also the *durability of* these gases, so as to enable me to fix, as far as possible, their *comparative value*, and, consequently, their comparative *expense*, for the purpose of illumination. Besides these, however, my attention was drawn to other circumstances connected with the consumption of gas, which, strictly bearing on the other part of the inquiry, are of importance.

1. *Quality of the Gases.*

In estimating the quality of coal gases, and, consequently, fixing their comparative value for the purposes of illumination, we must take into account both the light afforded, and the time required for the consumpt of equal volumes.

In trying the former, I have, in the following experiments, invariably had recourse to the method mentioned in my former papers, viz., the condensation by chlorine, and in which, now that the trials have been greatly extended, I place the utmost confidence.

For ascertaining the latter I have followed the usual method, an accurately-adjusted experimental meter; by which the times required for the consumpt of equal volumes, burning under similar circumstances, and also the quantity consumed in equal times, were easily determined. The jet burner was the same in all the trals.

I consider both of these circumstances absolutely necessary, for, though some have insisted only on the one, and others on the other only, yet, unless both be taken into account, we do not arrive at the true *value* of the gases, and, consequently, cannot compare one with another for the purpose of illumination. Thus, if two gases afford by their combustion, from the same or similar burners, with the same height of flame, the same light; but if a foot of the one lasts an hour, and a foot of the other an hour and a half, then the latter is one half more in value than the former for yielding light, because it is giving the same light for one half more time; or, which is the same thing, one half more of the former must be used so as to complete the time which the latter will burn. This, I regret to say, has been too often overlooked by many in estimating the value of coal gas.

As the chief object I had in view was, not the comparison of the light afforded by coal gas, or its expense, as compared with other sources of light, but merely the value of the gases as *compared with one another*, when obtained from different coals, I shall commence with that got from English caking coal, and take it as the unit for comparison.

English Caking Coal Gas.—The gas from this kind of coal, on which my experiments were made, was that at Newcastle; others were also procured by means of an experimental apparatus, fitted up expressly for the purpose. The condensation by chlorine in the former was, on an average of several trials, 4·33 per cent.

The specific gravity, at thermometer 60, barometer 30, was 420.

The durability, with a four-inch flame, from a platinum jet $\frac{1}{35}$d of an inch in diameter, was 1 cubic foot in 50 minutes 30 seconds. The pressure by water gauge at the burner was $\frac{1}{10}$ths of an inch.

From 1 ton of coal about 8000 cubic feet of gas are obtained.

The gases obtained with my experimental apparatus, from a variety of samples, of the same kind of coal, both lately, and several years ago, were very nearly of the same composition. Different heats were used in driving off the gas, with the view of finding the best heat. The condensation by chlorine varied from 3·5 to 5·5; the average of the trials, amounting to eight, was nearly 5. The durability varied from 47 min. 20 sec. to 53 min. 30 sec.; the average being 50 min. 25 sec.

The average specific gravity of eight different gases was 464, the highest being 512, the lowest 414.

As above mentioned, I take the gas from this kind of coal for illuminating power and durability, and, consequently, for *value*, as my standard of comparison.

English Cannel Coal Gas.—The gas obtained from this kind of coal, such as that from Wigan, in Lancashire, with which Liverpool, Salford, and other places are supplied, and that from coals found in different parts of Yorkshire, which are occasionally used at Manchester, are very nearly of the same quality.

The *Yorkshire Parrot Coal*, in its appearance and quality, is altogether different from the English caking coal. It more nearly resembles the parrot coal of Scotland. The condensation by chlorine was 7·66; the durability, 52 min. 30 sec.; pressure at burner, $\frac{8}{10}$. A ton of coals yields about 11,500 feet.

I have already stated that the chlorine test with English caking coal gas indicated 4·33, that with the Yorkshire cannel coal gas being 7·66; consequently, the illuminating power is as 1 to 1·76. The durabilities being 50 min. 30 sec., and 52 min. 30 sec., they are as 1 to 1·03; both taken together makes the value of the latter, for the purpose of illumination, 1·81 to the former, as 1·(1 : 1·76 :: 1·03 : 1·81).

Wigan Cannel Coal Gas.—I have had several opportunities of testing the quality of gas from this kind of coal, as at Liverpool, Salford, &c., at which the gas was found to be of the same quality. The chlorine indicated 7·55. The durability was 57 min.; the pressure at the burner, $\frac{8}{10}$ths and $\frac{9}{10}$ths, sp. gr. from 460 to 520. The quantity of gas from a ton of coal was 9500 feet.*

Newcastle coal gas being by the chlorine 4·33, and the Wigan cannel gas 7·55, they are as 1 to 1·73. The durability being 50 min. 30 sec. and 57 min., they are 1 to 1·12. Taking both into account, then the value is as 1 to 1·93 (1 : 1·73 : : 1.12 : 1·93), which is nearly the same as that of the gas from Yorkshire cannel, already given as 1·81. We may take the average value of the gas from English parrot coal, so far as these trials go, as 1·85 compared to that from English caking coal, as 1.

Scottish Parrot Coal.—I have had many opportunities of testing the quality of gas from this kind of coal, not only as manufactured at gas works, but also when made by my experimental apparatus in Edinburgh and Aberdeen. I have already in a paper, published in the transactions of the society, for 1842, given the results of numerous trials conducted in Edinburgh. I have now to allude, not only to those made in different towns of Scotland, but also to a very extended series more lately carried on with the experimental apparatus.

The gas from all the varieties of Scottish parrot coal is of superior quality to that from the best English parrot; but it varies very much according to the kind of coal. In all of the towns in Scotland that I have visited a mixture of one of fine quality, and of one or more of inferior quality, is employed in the manufacture of gas; partly because the former cannot be got in sufficient quantity, partly because it is too expensive; and hence, with one or two exceptions, chiefly in the smaller towns, the quantity of gas was found to be very nearly the same.

In the paper already alluded to I have stated the condensation by chlorine, with the gases prepared from the coals there mentioned, to vary from 9 to about 20. With two exceptions I never found it under 12; the average of all the trials, amounting to upwards of 20, may be taken as 15, that is, very nearly double of that with the English cannel coal; and 3·46 as great as that with the English caking coal; thus making the illuminating power, English caking 1, English cannel 1·85, Scottish cannel 3·46. The English cannel being 1, the Scottish cannel is 2, or very nearly so.

* In one instance I found the quantity of gas amount to 11,500 feet; but in this case the quality of the gas was not so good. I prefer, therefore, taking the one above.

The trials with the same gases show the durability to vary from 56 min. to 94 min.; with the two exceptions above mentioned, it was not below 70 min.,—the average of the trials was 80 min.; making the durability as 1·58 to the Newcastle, and 1·48 or 1·45 to the average of the English cannel as 1. Now, taking both into account, the value of the Scottish parrot coal gas, bulk for bulk, for affording light in these trials, is as 5·46 to Newcastle, as 1 and 2·68 to English parrot, as 1.

Since these experiments were made public I have been engaged in a very extensive series of trials with parrot coals procured from Fifeshire, the Lothians, and the western districts of Scotland, so as to ascertain the value of the gases which they afford. The gases were manufactured with the experimental apparatus, and under a variety of circumstances, so as not only to secure accuracy, but also to observe how far the manufacture, &c., is affected by a difference in the mode of conducting it. It is not my intention to allude to these farther than to state, that, taking the average of the trials, amounting to upwards of forty, I found the chlorine test and the durability to be very nearly the same as those given above.

With regard to the gas with which the towns in Scotland are supplied, I have already said, that in manufacturing it a mixture of different kinds of coal is employed, according to the situation of the town, and the supply that can be obtained. At Edinburgh the coal is chiefly from the Lothians and from Fifeshire. At Glasgow it is got from Lesmahago, Kelvinside, Wilsontown, &c. At Greenock, Monkland and Skaterig coals are employed. In the towns in the north of Scotland they are obtained chiefly from Lesmahago and Fifeshire.

The price of coals varies according to the kind of coal. At Edinburgh and in the west it is from about 20s. to 23s. per ton. In the north, however, it becomes higher and higher, according to the distance, and, consequently, to the carriage from the pits.

In the larger towns that I have visited I have found very little variation in the quality of the gas obtained from the different mixtures used. The chlorine indicated from 10 to 15; the average may be taken as 14. The durability was from 70 min. to 90 min., very rarely below 80,—on an average, it was a little beyond 80—say 80. The pressure at the burner varied from $\frac{60}{100}$ths to $\frac{74}{100}$ths. The sp. gr. was, on an average, about 640. Thus, then, the illuminating power of the gas with which the towns in Scotland are supplied is, on an average, as 3·23 to the Newcastle coal gas, and 1·85 to the average of English cannel, both taken as 1. The durability is as 1·58 to English caking, and 1·45 to the other, both as 1. Accordingly, taking both into account, the value of these gases, bulk for bulk, for the purpose of illumination, is English caking 1, English cannel 1·85, the average of the gas in the towns of Scotland 5·1, say 5. Taking the English cannel coal gas 1, then the Scottish is from 2·63 to 2·72, say 2·7. From the mixed coal employed in different towns a ton yielded on an average 9500 feet of gas.

2. *Value of Coals for the Purpose of Illumination.*

Keeping in view what has now been said regarding the quality of gas which the different kinds of coal afford, an estimate may be formed of the comparative value of these coals for that purpose, independent of the price paid for the coals, and also of the returns made for coke and other matters disposed of, such as ammonia, &c.; and, in doing so, I still take the *English caking coal as unity.*

A ton of English caking coal yields, on an average, at gas works, 8000 feet of gas, and though a larger quantity was given with my apparatus, yet we must take 8000 as the quantity on a large scale. The value of the coal is taken as 1.

The *Wigan cannel* yielded 9500 and 11,500; the value of the gas, bulk for bulk, being the same, viz., 1·85 to the former as 1. Now, taking into account the quantity of gas afforded, the value of the coals for yielding light, by the consumpt of their gases, is as 2·23 for the one quantity, and 2·5 for the other; taking the average, we state the value of English cannel coal as 2.35, or say 2½ to Newcastle caking coal as 1.

Scottish Parrot.—While the English cannel coals may be considered as of the same value at different places, it is not so with the Scottish parrot. I have said that it varies very much in different districts; and hence, though the value of the gases with which the different towns are supplied is very nearly the same in all, owing to mixtures of coals of superior and inferior quality being used, yet the value of the different coals varies considerably, owing to the quality and quantity of gas which they afford varying.

I have taken the average value of the Scottish parrot coal gas as 5, compared to that from the English caking coal as 1. The quantity of gas from the latter being 8000, and that from the former 9500, then the value of the coals for the amount of light afforded by the combustion of their gases is as 6·1 to 1.

The above must be considered as the value of the Scottish parrot coals *on an average*, or as used in their *mixed state*, as is generally done by gas companies. It may be interesting to state the value of some of the coals themselves. The poorest Scottish parrot I have yet examined yielded only 9000 feet of gas, the value of which was 2·2 to that of the English caking coal gas as 1; making, accordingly, the value of the coal for yielding light only 2·5, or very nearly so.

The value of the gas from Lesmahago coal, which by gas-

makers is generally considered the best in the market, I have found to be 6·6 to the English caking coal gas as 1; the quantity of gas being 1·13 to 1; accordingly the value of Lesmahago coal is at least 7 to 1. Since the publication of my paper in 1842, I have had more valuable coals submitted to trial; but as these are not, so far as I know, in the market at present, they must not be taken into account in fixing the average value of Scottish parrot coal. As above stated, we must still consider the value of this coal as about 6 to the Newcastle caking as 1; of course its value compared with the English cannel will be 2·6 to 1.

I have said that the value of the coke has not been taken into account in these calculations; it must, however, be borne in mind that while I have fixed the value of the Newcastle coal for affording light by the combustion of its gas as very low, compared to that of the cannel coals, yet, taking into account the greater quantity of coke which it yields, and the higher price at which that coke is sold, the value of the coal to gas-manufacturers becomes comparatively greater than I have stated, of course, in this point of view, reducing the value of the others as compared with it; but then this has nothing to do with the question under consideration, viz., the comparative value of the coals for affording light by the combustion of their gases.

3. *Expense for Light by different Gases.*

Having fixed the value of the gases obtained from the varieties of coal mentioned, I have now to advert to the prices paid for the gases at different places, with the view of showing the comparative expense to consumers for the same amount of light.

In examining this part of the subject a difficulty occurs, owing to the different methods followed in charging for gas in different towns. The following remarks must therefore be considered only as an approximation to the truth.

English Caking Coal Gas.—The charge for this gas is about 4s. 6d. per 1000 feet, as at Newcastle, subject to discount, by which, and by charge for street-lamps, the average price may be taken as 3s. 10d. Let us take this as unity.

In the different towns I have visited in England, where *English cannel coal* is used, the charge varies from 4s. 6d. to 5s. 6d. Suppose we take the average at 5s., then the comparative charge for it, and for English caking coal gas, is as 1·3 to 1. But the value of the gases, bulk for bulk, for the purposes of illumination, being as 1·85 to 1, then the comparative price paid for the same amount of light is only 75 to 100.

The price charged for the *Scottish parrot* coal gas varies considerably in different towns, owing chiefly to the difference in the expense of coal. I have found it to vary, in the larger towns, from 5s. to 7s., but, making allowance for discount, it goes from 5s. to 6s. 6d. Taking it as 5s., then the charge, compared with the English caking coal gas, is 1 to 1·3; taking the *value* of the gases into account, the price paid, for equal amounts of light, is as 25 to 100; accordingly, to light to the same extent with these gases, the expense for the English gas is four times as great as that for the other. At 6s. it would be 30 to 100, and at 6s. 6d. it would be 33 to 100; and hence the price paid for equal amounts of light varies from one-third to one-fourth of that paid for the English caking coal gas.

I have given the comparative value of the English parrot coal gas and of the Scottish as 1 and 2·7, the average price for the former being 5s., that for the latter 5s., 6s., and 6s. 6d. For the first, the price paid being the same, the expense for equal lights will be inversely as the value of the gases; 2·7 to 1; at 6s. 6d., the highest charge, the comparative expense is about 2 to 1. Accordingly, the expense paid for the same extent of lighting by these gases varies from about 2 to 2¾ for the English, to the Scottish as 1; that is, the expense for a given amount of light, for a certain time, by Scottish gas being 1, that for the same light, during the same time, with the English parrot coal gas, is from 2 to 2¾, and for the English caking coal gas from 3 to 4, according to the price paid for the Scottish gas.

In making these remarks regarding the value of the gases in different places, and the consequent prices paid for equal amounts of light, I trust it will not be supposed that I mean to insinuate that the price paid by consumers of gas in England for their light is too great, and that, consequently, it ought to be reduced, so as to bring it to a par, or nearly so, with that paid in Scotland. So far from that being the case, I believe that at present some English gas companies are charging for their gas a price which does not remunerate them; and that, instead of it being lowered, it ought to be raised. It must be borne in mind that the price of gas, like that of other manufactured goods, must be regulated, in a great measure, by that paid for the raw material; and it so happens that in England they are not so fortunate as we are in Scotland, where there is a coal which, though much more expensive than the English coal, yet is superior to it for the manufacture of gas; in so far that it yields an article of much higher value for the purposes of illumination; but then, were this coal used in England, it would, most probably, owing to carriage, &c., become so expensive as to cause the charge for the same light to be more expensive than it is at present.

In considering the results of the trials now recorded, the most superficial observer must be struck with the remarkable fact, that gases, having the same illuminating power, require, with the same burners, very different times for the consumpt of equal volumes; and hence, as I have already said, it is necessary, in ascertaining the *value* of a gas, for the purposes of illumination, to take into account not only the illuminating powers, but also the durability. Though I alluded to this in a former paper, published in the transactions of the society, for 1842, my attention has been more particularly drawn to it during the investigations in which I have been lately engaged, by observing the striking difference between the durabilities of gases obtained from Scottish cannel coals, procured from different districts; and hence the remarkable circumstance, that two coals may both yield the same quantity of gas, and which gases, when burned under similar circumstances, are of the same illuminating power, yet these coals may be of different value for the manufacture of gas, in so far that the gas from the one will burn a longer time than that from the other will do, when consumed in the same way. This is well illustrated with the coals of the Lothians, and of the west of Scotland. Thus, the average condensation by chlorine of the gas from the Marquis of Lothian coal was, in my trials, 13·135, the average durability 59 min. 30 sec.; while with the Lesmahago coal gas the former was 15·77, but the latter was only 62 min. 24 sec. Had the one been in proportion to the other, the durability ought to have been 71 min. 30 sec., or nearly so, The same remark is applicable to the varieties of coal from the west of Scotland, when compared with one another. Thus, the average indication by chlorine with the Skaterig and Knightswood coal gas was 9, the durability 46 min. 45 sec. With the Lesmahago, as above, they were respectively 15·77 and 62 min. 24 sec. The latter, to keep pace with that of the former, ought to have been 81 min. 54 sec.

I have observed similar results in trials which I have lately made. Thus three coals, submitted to experiment, yielded gases, the indication of which by chlorine was 14; the durability in the one being 57 min., in the other two 66 min.; and again, with other gases, in which the condensible matter was as high as 19 and 22, the durability did not exceed 77 min. and 81 min. In numerous trials I found that the gas from English caking coal gave condensation by chlorine 4·33, and durability 56 min. 30 sec., or nearly so. That from Wigan cannel coal had condensation as 7·5, but the durability was only 57 min.; the Yorkshire cannel coal gas was, condensation 7·66, and durability only 52 min. 30 sec. Had the durability of the English cannel coal gas kept pace with the condensation test, it ought to have been at least 87 min. instead of 52 min. and 57 min.

It is evident from this that the durability is affected by other circumstances than the presence of the ingredient, whatever it may be, which causes the condensation by chlorine; in other words, than by the illuminating power.

Considering this still farther, I observed a remarkable coincidence between the durability and the specific gravity, as is shown in the following table:—

Sp. Gr.	620	627	645	659	704	740	836
Dur.	55	64 m.	66 m.	67 m.	77 m.·5 s.	91 m.·7s.	106m.

In the above table it is shown that, as the specific gravity becomes greater, the times required for the consumpt of equal quantities become longer; but the increase of the one does not keep pace with that of the other. There is, however, some connection between them, and on farther investigation it occurred to me that perhaps the consumpt of gases by combustion is regulated by the same law as the diffusion of gases, as pointed out by Professor Graham, viz., that *under equal pressures the diffusion is inversely as the square roots of the specific gravities.* Accordingly, in equal times, the *consumpt* should be inversely as the square roots of the specific gravities; and, conversely, the *times* for the consumpt of equal volumes, from similar burners, and under the same circumstances, will be as the roots of the gravities.

Again, if this be true, then, under different pressures, the escape should be as the square roots of the pressures; and, accordingly, the time for equal consumpts should be inversely as the roots of these pressures.

To put this to the test of experiment, I procured a platinum jet, furnished with a graduated pressure-gauge, and adapted it to an experimental meter, by which I could consume the gas, under the same and different pressures, and mark the quantity consumed in a given time; and consequently the times for the consumpt of equal quantities. The gauge had a vernier fitted to it, by which I could easily read off to one-hundredths of an inch. The temperature and barometer were also noted for each experiment, and the specific gravity, when necessary, was ascertained in the usual way.

The following are the results of trials made for the purpose of putting these opinions to the test.

Consumpt of Gases under different Pressures.

Numerous experiments were made for ascertaining this, first with gauges of small diameter, the results of which did not agree with each other; but when the diameter was about half an inch they more nearly corresponded.

I give the following from among many :—

Burners.	Pressure.	Square root of Pressure.	Consumpt by Meter.	Consumpt by Calculation.	Difference.
Jet,	4	2	2·2	2·2	—
	8	2·82	3·3	3·3	—
	16	4	4·8	4·4	0·4
Jet,	3	1·73	2·6	2·6	—
	6	2.65	3·6	3·9	0·3
	12	3·47	5·8	5·2	0·4
Jet,	8	2·82	7·01	7·01	—
	16	4	10·511	9·92	0·59
Jet,	50	7·07	5·07	5·07	—
	100	10	7·06	7·07	0·01
	200	14·14	9·64	10·14	0·50

The following are the results with different kinds of burners, the trials having been conducted with the view of ascertaining the illuminating power by these burners :—

Small Fishtail,	34	5·83	1·41	—	—
	77	8·79	2·16	2·13	0·03
Large Fishtail,	48	6·92	2·27	—	—
	97	9·84	3·3	3·2	0·1
Large Fishtail,	50	7·07	2·2	—	—
	70	8·36	2·5	2·6	0·1
Large Batwing,	70	8·36	3·1	—	—
	140	11·8	4·5	4·37	0·13

From the above it will be seen that the escapes are very nearly as the roots of the pressures.

(To be continued.) See 76

VULCANIZED INDIA-RUBBER JOINTS FOR WATER AND GAS PIPES.

From the Report of THOMAS WICKSTEED, Esq., *Engineer to the East London Water Works, &c.*

On the 29th of February last Mr. Brockedon called my attention to a new method of making the joints of socket-pipes for water and gas. He exhibited a spigot and socket-pipe made of glass of two inches bore, and upon the spigot stretched a ring of vulcanized indiarubber, the external diameter of the ring, when stretched, being greater than the internal diameter of the socket into which it was to be introduced. In stretching the ring upon the extreme end of the spigot, care was taken to avoid twisting it. He then, with very great ease, pushed the spigot, with the ring upon it, into the socket, and the operation of making the joint was completed. When the spigot was pushed into the socket, the ring rolled along the pipe until the end of the spigot came home, the ring remaining fixed about the middle of the depth of the socket. If the ring had been twisted it would not have rolled in regularly, and would not, therefore, have been equally compressed.

The facility with which the joint was made was very remarkable, the whole operation being completed in a minute; and in this respect the saving of time and labour, as compared with that required for lead or wood joints, is very considerable.

Mr. Brockedon wished me to try experiments upon this new joint, and make such investigations as I might consider necessary to satisfy myself of its value with a view to its general introduction. This I have done, and the result is very favourable.

The facts to be ascertained were, the durability of the material as compared with materials usually employed, its capability of resisting pressure, and the cost of making the joint, all equally important in a commercial point of view.

First. *As regards its durability.*—I consider it a question that should be determined by chemists; and the report of Mr. Arthur Aikin, given at the end of this report, satisfied me of its superiority, in this respect, to lead or wood; and I believe practical experience, since the introduction of vulcanized indiarubber, fully corroborates these opinions. As, however, the question of durability cannot be practically determined in a few years, and as it is most important, in a commercial point of view, that the material used for joints should be very durable; so, the time since the introduction of this material being comparatively short, I felt it was necessary to have the opinions of those who were well qualified to give them upon the probable durability of the material, as compared with others now employed. One fact is well worthy of notice, as regards the action of the products of coal upon this material, especially as they appear to be the only liquids that affect it. Naphtha, it appears, will *dissolve* simple or unvulcanized caoutchouc, but only *swells* it when vulcanized; and thus the effect, which for some purposes would be injurious, for this purpose is advantageous, as the effect of it is to make the joint tighter.

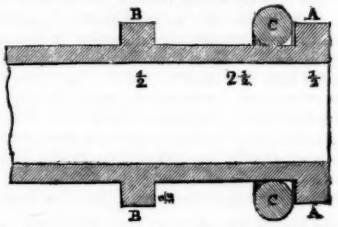
As a general principle there can be no doubt that, *cæteris paribus*, the more elastic the material for a joint the better, as the friction of an elastic body pressing against the pipes is much greater than that of an inelastic body; and hence the resistance to pressure, or force exerted to displace it, must be much greater. In a joint made with lead the resistance to the pressure is owing to the melted lead filling up any irregularities in the surfaces of the spigot and socket, thus forming a key, and also to the compression of the lead, effected in "setting up." Now, this effect does not extend above a quarter of an inch beyond the external face of the joint, and, therefore, it is most important that this operation should be carefully performed. Great force is employed in "setting up;" it is, therefore, necessary to have the thickness of the sockets greater than the rest of the pipe, to prevent its splitting during this operation. Again, in a wood joint, the operation of driving in the wooden wedge causes it to be compressed; thus the wedge which, before driving, is from $\frac{1}{4}$ an inch to $\frac{3}{8}$ of an inch in thickness, is compressed to the thickness of $\frac{3}{8}$ of an inch when in its place, this compressed part being about one inch in depth of the socket. Now, in this operation, although the wedge may be driven in so tight that neither air nor water can pass through, and so far this cause of decay avoided, nevertheless the fibres of the wood are injured by the operation of driving, and its elasticity consequently much impaired. In this case also it is necessary to have the sockets made strong to resist the force applied in driving in the wedges. With a body as elastic vulcanized indiarubber, however, such force is not necessary, the material cannot be forced or driven in with a hammer, it is merely rolled in; and the ring, which before compression is round, when its place takes the form of a flat belt instead of a circular ring. Thus, supposing the thickness of a ring to be $\frac{6}{8}$ of an inch diameter before compression, when rolled into the socket, with a space of $\frac{1}{4}$ of an inch between the spigot and the socket, it becomes a belt of $\frac{6}{32} \times \frac{16}{32}\frac{1}{2}$; or the depth of the belt is more than double its thickness; and this elastic flat belt of rubber, which has naturally an excessive tendency to resist sliding, is constantly endeavouring to resume its circular form, and hence the great friction exerted on the sides of the pipes, while in this compressed state.

[Here follows an account of seventeen different experiments made by Mr. Wicksteed to test the efficiency of these joints.]

The time occupied in these trials has been above five months, and I am now enabled to speak very confidently of the value of the new joints.

It appears that for a 4-inch joint, the space between the spigot and socket being $\frac{1}{4}$ of an inch all round, the vulcanized india-rubber ring should weigh $1\frac{1}{2}$ ounce; and for a 12-inch ring, the space between the spigot and socket being the same, viz., $\frac{1}{4}$ of an inch, the weight of the ring should be $5\frac{1}{4}$ ounces.

Section of spigot-end of pipe.



A, end fillet or belt. B, upper fillet. C, section of vulcanized india-rubber ring.

The spigot and socket ends of pipes to suit the vulcanized india-rubber rings should be formed as follows :—The depth of the socket for all pipes up to 12 inches, which is the largest I have experimented upon, should be $3\frac{1}{4}$ inches; the thickness of the joint or space between the outside of the spigot and inside the socket should $\frac{1}{4}$ of an inch. There will be no occasion for extra strength in the sockets, as they are not exposed to any blows or to the force of the wedge in making the joint, as in lead and wood joints. The spigot should have a square head or belt $\frac{3}{16}$ths of an inch thick, and $\frac{1}{2}$ an inch deep, cast on the end, then a clear space of $2\frac{1}{2}$ inches, and then another belt of the same dimensions, as shown in the engraving.

This will allow a play of $\frac{1}{16}$th of an inch all round, and the upper belt will effectually prevent the joint blowing out, should there be any slight deficiency of thickness in the indiarubber ring, or should the ring be put on the spigot carelessly; this, however, can scarcely ever happen, as the fillet at the end of the spigot will be a guide to the workman, and very much facilitate the fixing of the ring properly.

I have calculated the weight and cost of 100 rings of various sizes, which will be the number required for 300 yards of pipes, as follows :—

Size. Inches.	Weight. lb.	oz.	Per lb.	£	s.	d.
3	7	0	At 5s.*	1	15	0
4	9	6	..	2	6	$10\frac{1}{2}$
5	12	5	..	3	1	$6\frac{3}{4}$
6	15	4	..	3	16	3
7	18	3	..	4	10	$11\frac{1}{4}$
8	22	2	..	5	5	$7\frac{1}{2}$
9	24	1	..	6	0	$3\frac{3}{4}$
10	27	0	..	6	15	0
11	29	15	..	7	9	$8\frac{1}{4}$
12	32	14	..	8	4	$4\frac{1}{2}$

To make a comparison between the cost of the indiarubber joints and lead or wood joints, I have in the following statement included the material, the labour in making the joint, and the excavation and filling in of the trench only, but including 10 per cent. profit:—

	At per yard run.						Vulcanized Indiarubber.	
	Lead.		Wood.		Indiarubber.		Cheaper than Lead.	Cheaper than Wood.
	s.	d.	s.	d.	s.	d.		
4 inch . . .		$6\frac{6}{10}$		$4\frac{6}{10}$		$3\frac{3}{10}$	100 per cent.†	42 per cent.
12 inch . . .	1	7	11			$9\frac{9}{10}$	91 „	11 „
3, 4, 5, 6, 7, 8, 9, 10, 11, 12 in., one yard of each	10	0	6	2	5	2	93 „	19 „

Taking one yard of each-sized pipe, from 3 inches to 12 inches inclusive, and, in addition to the above, adding the average cost of carting the pipes to the trench, removing surplus earth, repairing drains, lead pipes, &c., and all other charges and risks, and guarantee for twelve months, excepting the charges of the commissioners of roads or streets for paving, &c., the cost will be as follows:—

Lead.	Wood.	Indiarubber.	India-rubber cheaper than lead.	India-rubber cheaper than wood.
23s. 10d.	20s. 6d.	19s. 6d.	22 per cent.	5 per cent.

The prices given may vary according to the locality and nature of the ground, but, I believe, will be found in every case very moderate for good and sound work. Where there is rock, or paved or macadamized roads, to be excavated for the trench, the saving in laying the joints with indiarubber rings will be very great, as the extra excavation required round the joint for lead, cement, or wood joints, to afford sufficient room for the jointmaker to work all round the joint, will not be required for the indiarubber joints; and hence the saving in excavating through rock, and excavating or taking up and renewing the paved and macadamized roads, will be considerable.

When the wood joints are used (and they have been used very extensively in the East London district for the last sixteen or seventeen years, and found to answer remarkably well), it is necessary to expose the joints to the pressure of water they are intended to bear, before the ground is filled in, to be certain that the joints are tight; hence, unless in connection with mains already charged, they cannot be employed, for the expense of working a force-pump to fill every length of pipe before it is covered swallows up all the saving that, under other and more favourable circumstances, is effected; so that for new towns, or places where there are no charged mains already in existence, they cannot be used; and for gas pipes they are not at all applicable.

An objection was made many years ago to the wooden joints that where the pipes had to be much curved it would not be safe to make an unequal joint, thick on one side and thin on the other, while with lead this might be done by a clever jointmaker. The same objection may be made to the proposed joint, on account of the belts preventing a greater play than $\frac{1}{16}$th of an inch in the socket, the answer given in the frst instance will do in the second, should it be made; viz., that the number of joints required to be so made formed an inconsiderable per centage upon the whole number made, and, therefore, formed no sufficient objection to the *general* use of a cheaper joint.

As regards its applicability to gas pipes, I have some hesitation in giving a strong opinion; but as Mr. Aikin's report proves that it is a durable material, and is not injuriously affected by the products of coal gas which collect in the pipes, and as it appears from my experiments that the joint can stand an enormous pressure, I think it may, probably, be found the *best* material that could be used for a gas joint. I believe it will be admitted that, with the materials ordinarily employed in joining gas pipes, it is difficult to fill the joint so thoroughly as to prevent the escape of gas, which the colour of the earth near the joints of gas pipes will prove; and although a lead or wood joint may be made capable of withstanding great pressure, and so as to prevent *water* leaking through, nevertheless *gas* will escape through. Reasoning upon the matter would, therefore, lead to the conclusion that if a very elastic body is used, pressing with great force on all the surfaces of the iron in contact with it, so as to fill every space, there is much greater certainty of forming a tight joint than with a non-elastic substance, where the density of the material is all that prevents the escape of *gas*; it must be borne in mind that the indiarubber is impervious, and can never be liable to have fissures in it, or pores through it, which may be the case with lead, cement, or wood, if not perfectly made,—not so large as to allow a liquid to pass through, but sufficiently so as to allow gas to pass through.

As regards pipes made of earthenware or glass, or other brittle material, which would be broken, if it were attempted to make joints of lead or wood, to withstand a pressure of water, this material is very applicable, as no force is applied in making the joint that would in the slightest degree tend to split or break the socket of the pipe. This joint removes the only mechanical objection that I believe exists to the use of these materials; but the chances of breaking when laid, and the cost of the pipes when so joined (increased by the shortness of the lengths of the pipes requiring a greater number of joints), are questions to be considered by those who propose using such materials. It appears that none of the products of the sewers would injuriously affect the vulcanized indiarubber. The improvement in making the indiarubber rings since I received the first for trial is very great. The first *set* varied in thickness and weight very much; the last are as regular in thickness, as can be proved by the weights of several of the same size being as nearly as possible the same. This is most important, as a variation in weight, which is the same as a variation in thickness, would prevent the certainty of tightness of the joint. I have, nevertheless, in the weights given in the table, allowed an extra weight as a precaution.

In conclusion, I beg leave to say that it appears that for strength, durability, resistance to pressure, and for the closeness of the joint preventing the escape of gases, this material is better suited than the ordinary materials in use; and that the cost of the joint is less than the cost of those in ordinary use for iron pipes.

REPORT OF ARTHUR AIKIN, ESQ., F.L.S., ETC.

Will Rings of Vulcanized Caoutchouc, when used as Fastenings of Cast Iron Pipes, retain their Elasticity, and what will be their probable Durability?

The resilient spring of vulcanized caoutchouc is far more complete than that of the caoutchouc not vulcanized. In other words, the former is far more liable to *tire* than the latter. Caoutchouc is vulcanized by combination with a certain small proportion of sulphur. As long, therefore, as caoutchouc remains vulcanized, that is, as long as it retains its sulphur, it may be expected to retain those qualities by which it is characterized. But iron has a strong attraction for sulphur. It is not, therefore, probable that vulcanized caoutchouc remaining long in contact with iron may give up its sulphur to this latter, and thus be reduced to the state of common caoutchouc?

I see no satisfactory way of bringing this question to the test of experiment, as both cast iron and common bar not unfrequently contain sulphur in various proportions. The rings of vulcanized caoutchouc that I have seen taken out of iron pipes return to their original form as soon as the nip or strong compression to which they were subject while in the pipes has been relieved; and they are stained externally by a little oxide of iron rubbed off from the inner surface of the pipe, in consequence of the strong friction and compression to which they are exposed in the act of inserting one pipe into the other. Beyond this merely superficial attrition, I do not think that any sensible action would take place between the ring and the iron, even for a very long time, at common temperatures.

If the pipes are intended for the conveyance of water, the exposure of the projecting edge of the ring to this liquid at common temperatures cannot possibly have any injurious effect; for I have boiled vulcanized as well as common caoutchouc for an hour at 300 degrees, and the pieces, when they have become dry, have shown no diminution of their respective degrees of elasticity. If the pipes are to be employed in conveying coal gas, the original question becomes complicated with the consideration, how far the volatile products of the distillation of coal are capable of acting on vulcanized caoutchouc? The principal matters driven off from coal during its distillation are carburetted hydrogen and olefiant gas, sulphuretted hydrogen, ammonia, tar. I believe that in a very short time the projecting edges of the vulcanized rings would be covered with a thin layer of tar, which would effectually prevent their contact with the other matters, even assuming these latter to have any action on vulcanized caoutchouc. Naphtha, the product of the rectification of coal tar, is capable of dissolving caoutchouc; but the only effect which it has, even when boiling hot, on *vulcanized* caoutchouc is to cause it to swell. If the crude tar should have any such effect (which I doubt) the consequence would be, that the projecting edge of the ring would swell, and thus render still more effectual a fastening which was sufficiently so before. The strongest liquid, ammonia, as I know by experiment, has no solvent action whatever, even on common caoutchouc, by digesting in it for several months. Sulphuretted hydrogen has no sensible effect on common caoutchouc immersed in it for some days. If, by long-continued action on vulcanized caoutchouc, any sulphur was taken up, no injury to the ring would result from this; for vulcanized caoutchouc may contain a great excess of sulphur, without at all impairing its elasticity and other valuable properties.

With regard to the durability of vulcanized caoutchouc compared with that of wood or lead, which, I believe, are the only substances at present used in joining iron pipes, the following circumstances must be taken into consideration:—

The compression and violence which wood undergoes in the act of being driven in will more or less damage its texture, and weaken the lateral cohesion of its fibres. Caoutchouc, being

* The wholesale price of vulcanized indiarubber; for small quantities it is 6s. per lb.

† 100 per cent cheaper is an erroneous expression; it would make the indiarubber cost nothing, for if 100 per cent. be taken from 100, there remains 0. It should be 50, 48, and 48 per cent. less than lead, and 20, 10, and 16 per cent. less than wood.

without visible pores, and being of a perfectly uniform consistence, and possessed of great elasticity, will not only exclude air and moisture from the space which it occupies, but is scarcely susceptible of mechanical injury, even from the strongest compression.

Lead is no more porous than caoutchouc, but, being almost totally inelastic, will, on this account, be a less effectual preventive of leakage. Some galvanic action will probably take place between the lead and iron tending to oxidize this latter; and, when galvanic action has ceased, from the interposition of a layer of oxide of iron between the two metallic surfaces, the lead itself will become oxidized superficially, from the combined effect of air and moisture.

I do not, therefore, see any reason to doubt that rings of vulcanized caoutchouc, when used as a fastening of iron pipes employed in the conveyance of water or coal gas, would be, at least, as durable as the best of the methods now practised, and probably more secure from leakage.*

THE INTERIOR ECONOMY OF THE RETORT HOUSE OF A PROVINCIAL GAS WORK.

There are few manufacturing operations in which order, system, and the power of a minute inspection of details are of such vital importance, or where greater loss may be incurred by the neglect of these elements of success, than in the manufacture of gas. A good balance-sheet at the year's end is no criterion of the able management of a gas work, inasmuch as it may possibly have been obtained at the expense of the future welfare of the concern, and wrung from a public who, on the first opportunity, may take a terrible revenge. In these levelling times, when all exclusive privileges and legislative protection have been expunged from our social system, and become unknown to the present generation, it is doubly imperative that those charged with the direction of this great branch of industry should be able to show that they have not negligently administered the interests committed to their keeping.

In the larger cities of this empire this question is well understood, and efficient officers are employed in the several departments, whose duty it is to keep accurate records of their operations, and thus enable them to compare notes with their neighbours; while, on the contrary, in some of the provincial towns, from those entrusted with the direction of gas works, through no indisposition or inability to conduct them with the greatest benefit to their owners, but from inexperience and ignorance of the advantages of a systematic control over their daily operations, little else is known beyond the amount of the gross yearly incomings and outgoings of the concern. Whether the coals used were of the best quality, and produced their proper quantity of gas and coke,—whether a larger or smaller proportion of fuel had been consumed this year than the last, or the pilfering from the coal and coke stores had ceased, or increased, or diminished, are questions which many persons are not in a condition to reply to, and are consequently unable to compare their experience in detail with that of their more systematic neighbours. Many of our friends have felt this inconvenience, and we purpose, in the present article, to point out a remedy to it, by indicating a system of internal economy which, while it but slightly augments the labours of those charged with the direction of gas works, will afford them the means of comparing the operations of one year with another year, or of one work with another work, and thus ensure, as far as practicable, that the best use is made of the materials with which they have to deal.

To carry out this system, it is absolutely necessary that every gas work should be provided with a station meter, the accuracy of which must be periodically tested. It would also be of advantage if a weighing machine could be fixed over which all coal used in the retorts could be passed; but this is not absolutely necessary, and may be dispensed with by experimenting periodically, say every three months, upon ten tons or upwards of coal which has been accurately weighed, and ascertaining its yield of coke and breeze; repeating the experiment whenever the quality of the coal is changed, and assuming the result of these experiments as the average products in coke and breeze of the coal distilled.

(Form A.)

	VI.	VII.	VIII.	IX.	X.	XI.	Noon.	I.	II.	III.	IV.	V.	VI.	VII.	VIII.	IX.	X.	XI.	Mid-night.	I.	II.	III.	IV.	V.	
Retorts																									
——— 1/1																									
——— 2/1																									
——— 3/1																									
——— 4/1																									
——— 0/1																									
——— 1/2																									
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——— 4/4																									
——— 0/4																									
Meter register																									
Gas in stock.....																									
Coke as fuel.....																									
Tar as fuel.....																									
Lime for purifiers ..																									
Coke carried to store																									

* Applied to the conveyance of gas, the tubing possesses many advantages. It may be fitted more readily and less expensively than metal, and, being in general when employed for this purpose covered with coloured silk or worsted, it becomes an ornament to an apartment, and may,

Two slates must be provided, ruled and engraved in the form A. One of these must constantly remain in the retort-house, under the charge of the foreman, stoker, or other person whose duty it is to note the several matters which it is designed to register, the other being with the manager for transcription. The twenty-four vertical columns are for the hours, and the figures against the horizontal lines indicate the several retorts, $\frac{4}{1}$ representing the fourth retort of the first bed, and $\frac{5}{4}$ the fifth retort of the fourth bed, or whatever other mode the superintendent may choose to adopt to indicate each retort. A separate line for each retort, instead of for each bed, is requisite in very small works, it being advisable to equalize the make of gas, and charge each retort in a bench by turns, instead of the whole at once. The foreman stoker marks on the slate the quantity of coal charged in each retort in the line appropriated to it, under the column of the hours, as well as notes the register of the station meter, the quantity of gas in stock at certain hours to be fixed by the manager, the quantity of lime employed in purification, and the hour when a new purifier was set in operation.

Where coke is used as fuel, instructions must be given to the foreman stoker that the coke from a certain portion of the retorts, say one in every three, shall be retained in the retort-house for fuel, and the rest carried to the coke-store; if more coke is wanted, it must be measured and carried back to the retort-house, and if there be any surplus it must also be measured and carried to the store, the quantity in both cases being noted on the slate.

Experiments will have been made to ascertain the quantity of tar yielded by a given quantity of coal, which will serve for estimating the quantity produced, and if any has been used as fuel it must be noted on the slate.

The slate so filled is handed to the manager each morning, he having previously abstracted the notes from the other slate, and returned it to the foreman stoker.

No coke should be allowed to go out of the premises without a printed note accompanying it, indicating to whom it is sold, the quantity, price, and whether for credit or cash. These notes should be cut out of a book, with a counterpart containing similar register.

The specific gravity of the gas must be constantly ascertained, taking care that the trial is made upon gas flowing from the gas-holder.

The memoranda thus taken by the foreman on the slates, are entered daily by the superintendent in a book containing thirteen sheets of the form B. (See next page.)

The calculation of the fuel used, gas made and expended, coke, tar, and breeze produced, are all easily made from the data before him.

An approximate estimate may be made of the cost of salaries, general expenses, and wear and tear per thousand feet upon the gas made in the previous year; or, in the absence of a station meter, an estimate of the gas made may be obtained by ascertaining the quantity of coal used, and multiplying by its known produce in gas per ton.

At the month's end the several columns are added up, and the averages struck. A standard is thus laid down which the superintendent will take an interest in improving from month to month, till he arrives at a perfection equal at least that of his neighbour; a friendly rivalry will also spring up between superintendents, which must benefit all parties, as it enables the proprietors of gas works to see their way clear in fixing such prices for gas as shall be remunerative without being exorbitant.

It will be our study to promote this interchange of working accounts and friendly communications between superintendents of provincial gas works; and, as the means of facilitating such, we beg to say that we have caused to be printed a number of books of the form B, which we shall be happy to supply to any subscriber who may demand them, at a small charge, as well as loose sheets for transmission by post.

As a further check upon the accuracy of the foreman-stoker returns, stock accounts must be kept for which the form C may be adopted.

[Form C.]

STOCK ACCOUNT FOR THE MONTH OF 18 .

	Tons. Cwts.	Tons. Cwts.
COAL. In stock from last month		
Received during this month		
Carbonized		
Used as fuel		
Do. for the forge		
Do. for pipe-laying		
Do. in house and offices		
Sold on credit		
Do. for cash		
In stock on		

	Chald. Bush.	Chald. Bush.
COKE. In stock from last month		
Produced this month		
Used as fuel		
Do. for pipe-laying		
Do. for house and offices		
Do. for heating new beds		
Sold on credit		
Do. for cash		
In stock on		

	Gallons.	Gallons.
TAR. In stock from last month		
Produced this month		
Used as fuel		
Do. on works		
Sold on credit		
Do. for cash		
In stock on		

	Bushels.	Bushels.
LIME. In stock from last month		
Received during the month		
Used for purification		
Do. other purposes		
In stock on		

	Hours.
Number of hours during which each public lamp has burnt in the month	

Number of Lights.	Public.	Contract.	Meter.
From previous month			
New lights this month			
Lights lost this month			
Balance			

In case of there being more than one store for coal or coke, there must be distinct columns for each store; and every available opportunity should be embraced for proving that the quantities shown by the stock account to be in store, are effectively there.

At the year's end these monthly returns may be all embodied in one yearly return, where the gross average cost of gas and its cost in each department is accurately shown, and that power of minute inspection is obtained which we maintain to be of vital consequence in the management of gas works.

It has not been the object of this article to indicate any particular system of making gas, or interfere in any manner with the opinions which are held on the details of apparatus, but simply to lead the way for the introduction of a better system of keeping working accounts than we have hitherto found adopted in many provincial gas works, and thus put them upon a par with those of the metropolitan and large cities of the empire, in the order and economy of their operations.

in addition, be raised or lowered, or even carried to some distance, with perfect facility. In places of public assembly, particularly public offices, counting houses, railway stations, manufactories, &c., and in many other situations, these qualities will doubtless be appreciated, since they tend to obviate many inconveniencies inseparable from the present, or, rather, the *recent*, mode of gas fitting.

Rating of Railways.—We understand that a deputation, consisting of the chairmen of the principal railway companies, had an interview lately with the chief poor-law commissioner on the subject of the rating of railway property. The result of the interview has not transpired, but the object of the deputation was to draw the attention of the chief commissioner to the intolerable and increasing pressure of local taxation which the declining dividends of railways have to bear; to point out the injustice of the present system of assessment, and the incompleteness and ill-defined nature of the machinery by which the law is now worked; and to suggest practical remedies for the consideration of Government.

[Form B.]

GAS WORKS.

RETURN FOR THE MONTH OF , 18 .

Days.	Dates.	Coal Carbonized.	FUEL.			Slow Fires.	Lime for Purifiers.	GAS.		Specific Gravity.	PRODUCTS.			Number of Retorts.	Number of Fires.
			Coke.	Coal.	Tar.	Coke.					Coke.	Tar.	Breeze.		
		Tons. Cwts.	Chal. Bus.	Tons. lbs.	Gals.	Chal. Bus.	Bushels.	Prod.	Cons.		Chal. Bus.	Gals.	Chal. Bus.		
	1														
	2														
	3														
	4														
	5														
	6														
	7														
	8														
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	29														
	30														
	31														

MANUFACTURING ACCOUNT.

EXPENDITURE.

	Dr. £ s. d.	Cr. £ s. d
To Coal account for Tons. Cwt. of Coals carbonized, at		
do. do. used as fuel, at		
Coke do. for Chal. Bush. of Coke do. at		
Tar do. for gallons of Tar do. at		
Lime do. for bushels of Lime for purifying, at		
Wages do. for Wages paid during the month		
Salaries do. for Salaries at per M. cubic feet of Gas made		
General Expenses account at do. do.		
Wear and Tear account at do. do.		

RETURNS.

By Coke account Chal. Bush. of Coke produced, at		
Tar do. gallons of Tar do. at		
Breeze do. . . . . at		
Gas do. M. feet of Gas produced, costing per M. feet		

Average Products per Ton of Coals.

Gas produced	cubic feet.
Coke do.	bushels (or cwts.)
Breeze do.	do. do.
Tar do.	gallons.
Liquor do.	do.

Coke, used as fuel, per ton of Coals,	bushels (or cwts.)
Do. surplus do. do.	do. do.
Lime, for purification do.	do. do.
Tar, used as fuel do. do.	gallons.
Average specific gravity of Gas	

Money Averages.

	s. d.
The Cost of Coal (less Coke, Breeze, and Tar) per 1000 feet of Gas made . .	
do. Fuel do. do.	
do. Lime do. do.	
do. Wages do. do.	
do. Salaries do. do.	
do. General Expenses do. do.	
do. Wear and Tear do. do.	
Cost price of Gas per thousand feet, as delivered into the gasholder	

Correspondence.

SPECIFIC GRAVITY APPARATUS.

SIR,—I have lately been making some experiments upon the density and quality of the gas supplied by the metropolitan gas companies, and am much perplexed by the different results I obtain according to the specific gravity apparatus I make use of. The balloon apparatus gives me the lowest results, and with it I have found gas of a specific gravity of ·360 and ·380, which with Crosley's apparatus weighed ·420 and ·430, upon repeated experiments. Will one of your correspondents be kind enough to give me his ideas as to the best apparatus in use for this purpose?

A SEARCHER AFTER TRUTH.

ON THE COST PRICE OF GAS.

SIR,—I had, some months since, prepared the following communication for insertion in the *Gas Gazette*, the suspension of which I, in common with many others, so much deplored. The agitation now existing on the subject of the supply of gas, at low prices, renders the publication of my experience in the matter the more opportune, and I hasten to avail myself of the revival of a periodical devoted exclusively to the subject, to throw my mite of knowledge into the common stock, feeling assured that a few well-authenticated facts are more interesting to the bulk of your readers and the public than a volume of speculative theories and promising prospectuses, the benefits of which vanish when tried by the test of experience.

I am no gas engineer, but still have a tolerably good idea of the principles upon which the manufacture of gas should be conducted, the nature of the material used in its production, its chemical composition, its products, and the mode of treating them to obtain the best results. I fancy, too, I know how to buy in the cheapest markets, and get a fair day's work at the lowest possible rate,—qualities of some value in the working of a manufacturing establishment; and this was nearly all I knew of gas lighting when, a few years since, the idea was suggested to me, to make an offer to lease the gas works for some years in operation in a little quiet market town. I, however, hesitated a long time, fearing to incur heavy responsibilities by undertaking a concern which for years had yielded no profit to its owners, and put myself in communication with parties competent to enlighten and reassure me before taking any decisive step. Acting under their advice, I resolved to make an offer to lease the concern, paying five per cent. interest on the capital invested, provided the owners would raise such further sum as might be needed to remodel the works and put them into efficient working order, under the inspection of an engineer whom I selected, and to whose advice and judgment I attribute much of the success of my adventure. My offer was accepted; the term of my lease has now expired; and having, therefore, ceased to be personally interested in the affair, I shall be gratified if any of your readers can add to their own stock of knowledge by an outline of my seven years' experience as a manufacturer of gas. My apparatus, as remodelled, consisted of ten iron retorts, each weighing about 18¼ cwt. (eight of them set in pairs and two singly), condenser, washer, dry lime purifier, Crosly's station meter, two gasholders, and all the improvements of which the state of knowledge at that period had shown the utility.

The capital expended, and upon which I had to pay interest, amounted, after the remodelling of the works, to £11,000; my yearly rent, or rather interest, payable was therefore £550.

I had the choice of several kinds of coals, but found that shipped at Cardiff to answer my purpose best; and I continued its use during the whole term of my lease. Its cost ranged from 16s. to 18s. per ton, and the coke was saleable at 4d. to 5d. per bushel. I was fortunate in the selection of a superintendent, to whose intelligence, skill, and attention I owe much, and by whose admirable manner of keeping my working accounts I could in an instant detect any excessive expenditure in each department, and was thus enabled without delay to apply a remedy. I paid him a salary of £100 a year, rather a large sum for the country, but still not greater than his talents would have enabled him to obtain elsewhere; and it will no doubt be interesting to your readers to see one of his yearly reports of the working of the establishment. It is a fair average one of my whole term. In the column appropriated to interest the taxes are also included, but in other respects the document is sufficiently explanatory to speak for itself. I had a similar account prepared weekly, from which the annexed is abstracted:—

Your readers will there see that the cost of the material, labour, wear and tear, and salaries, ranged from 2s. 5¾d. to 4s. 8½d. per thousand cubic feet, the average being 2s. 11½d., or 6s. 2½d. with 3s. 3d. added for interest on capital and taxes.

I should not forget to remark that the allowance of 6d. per thousand feet for wear and tear left a small surplus at the termination of my engagement.

The price now charged for gas is 7s. per thousand feet, which yields but a moderate profit on the capital invested.

AN EX-GAS MAKER.

1	2	3		4	5			6		7	8	9	10	11	12			13	14	15	16	17	18	19	20	21
Date.	No. of Retorts in use.	Coals used in Retorts.	Cost.	Gas made in M. Cubic Feet.	Fuel.		Total Cost.	Lime.		Wages.	Wear and Tear, at 6d. per M. Feet.	Salaries, at 6½d. per M. Feet.	Interest, at 3s. 3d. per M. Feet.	Total Gross Weekly Cost of Gas.	Coke produced.			Net Weekly Cost of Gas.	Gas made per Cwt. of Coal.	Gas Purified per Bushel of Lime.	Cost of Coals per M. Feet of Gas.	Cost of Fuel per M. Feet of Gas.	Cost of Lime per M. Feet of Gas.	Cost of Wages per M. Feet of Gas.	Total Net Cost of Gas per M. Feet.	Coke Sold.
					Coke.										Bushels.	Price.	Value at Selling Price.									Bushels.
		Cwts. Qrs.	£ s. d.		Bushels.	Price.	£ s. d.	Bushels.	Cost.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.		d.	£ s. d.	£ s. d.			d.	s. d.	d.	s. d.	s. d.	
Jan. -	6	1051 1	42 1 0	489	754	5	15 14 2	36	0 13 6	14 3 5	12 4 6	13 15 0½	79 9 3	178 0 10¼	1668	0	34 15 0	143 5 10½	464	13,570	3·58	0 7·70	0·33	0 6·95	5 10·11	880
Feb. -	6	789 3	31 11 10	369	482	0	10 0 10	22	0 8 3	13 16 3	9 4 6	10 7 6½	58 19 3	134 8 5½	1257	0	26 3 9	108 4 8½	464	16,770	3·51	0 6·53	0·36	0 8·98	5 11·13	721
March	4	722 1	28 17 10	320	523	0	10 17 11	26	0 9 9	13 14 0	8 0 0	9 0 0	52 0 0	122 19 6	1145	0	23 17 1	99 2 5	440	12,302	3·77	0 8·17	0·36	0 10·27	6 2·32	702
April -	4	693 1	23 15 0	263	536	0	11 3 4	28	0 10 6	11 12 10	6 11 6	7 7 11½	42 14 9	103 15 10½	850	0	17 14 2	86 1 8½	440	9,398	6·50	0 10·19	0·47	0 10·62	6 6·53	531
May -	2	300 0	13 15 0	127	264	4	4 8 0	5	0 1 11	6 8 8	3 3 6	3 11 5½	20 12 9	52 1 3¼	467	4	7 15 8	44 5 7½	422	25,360	11·27	0 8·31	0·18	1 0·15	6 11·66	225
June -	1	192 2	8 16 6	88	245	0	4 1 8	4	0 1 6	5 4 4	2 4 0	2 9 6	14 13 4	37 10 10	306	0	5 2 0	32 8 10	456	22,000	10·15	0 11·13	0·20	1 2·22	7 3·45	72
July -	1	185 2	8 3 7	83	271	0	4 10 4	5	0 1 11	7 3 4	2 1 6	2 6 8	13 16 8	38 4 0	297	0	4 19 0	33 5 0	448	16,652	9·33	1 1·33	0·27	1 8·72	7 11·40	63
August	4	467 2	18 14 0	204	497	0	8 5 8	26	0 9 9	13 14 8	5 2 0	5 14 9	33 3 0	85 3 10	745	0	12 8 4	72 15 6	434	7,836	7·39	0 9·74	0·57	1 4·15	7 1·60	189
Sept. -	4	636 3	25 9 4	288	469	0	7 16 4	26	0 9 9	13 18 9	7 4 0	8 2 0	46 16 0	109 16 3	1013	0	16 17 8	92 18 7	452	11,076	7·15	0 6·09	0·40	0 11·61	6 5·90	432
Oct. -	4	863 2	34 10 9	396	686	0	9 15 4	38	0 14 3	13 14 4	9 18 0	11 2 9	64 7 0	144 2 5	1366	0	22 15 4	121 7 1	458	10,437	7·13	0 5·91	0·43	0 8·31	6 1·53	909
Nov. -	6	989 2	39 11 3	461	715	5	13 6 4	43	0 16 2	14 18 11	11 10 6	12 19 3½	74 18 3	169 0 8½	1570	5	29 1 4	139 19 4½	464	10,722	5·47	0 6·93	0·42	0 7·62	6 0·09	801
Dec. -	6	1149 0	45 19 3	541	759	0	15 16 3	48	0 18 0	13 17 4	13 10 6	15 4 3½	87 18 0	193 3 7½	1831	0	33 2 11	155 0 8½	456	11,272	3·46	0 7·01	0·39	0 6·15	5 8·76	910
		7941 1	321 5 10	3629	6101	0	115 16 2	307	5 15 3	142 6 10	90 14 6	102 1 3½	589 8 3	1368 7 8¼	12515	0	239 12 3	1128 15 5½	456	8,564	5·40	0 7·65	0·38	0 9·40	6 2·58	6435

ON THE HIRE OF GAS FITTINGS.

Devonport, Jan. 19, 1849.

SIR,—Believing that the subject of gas-fittings and their supply is not without interest to the various parties connected with gas-lighting, I will, with your permission, make a few remarks upon the working of a system adopted by the Devonport Gas Company in May, 1847, for the supply of fittings, &c., at an annual rental. This measure was introduced to induce the use of gas for private and domestic uses, so as to increase the consumption (which was then almost stationary), and by this means enable the company to reduce the price of gas without loss to 5s. per 1000 cubic feet.

The inhabitants of this town have availed themselves very generally of the advantages thus held out, and the result has been so large an increase in the supply of gas that the amount of profit was greater upon the year's working, although the price was less by 1s. per 1000 cubic feet. The quantity of gas used from June 1, 1846, to May 31, 1847, was 10,134,500 cubic feet; at 6s. per 1000, produced a rental of £3040. 7s. From June 1, 1847, to May 31, 1848, the quantity of gas used was 13,642,750; at 5s. per 1000 cubic feet, produced a rental of £3411. 8s. 9d., being an increase in the year's consumption of 3,508,280 cublic feet of gas, equal to 34 per cent.

The rental charged for the use of the fittings, &c., was at the rate of 7½ per cent. per annum; and the opinion of the directors of the company may be gathered from the following extracts from their report presented to a general meeting of shareholders held on the 29th of June, 1848:—"To encourage and extend the use of gas in private houses, your directors made known to you their determination to adopt the system of supplying gas fittings at an annual rental. This system has now been in operation for twelve months; they are enabled to state that it has in every way realized the expectations held out; and your directors believe that it has greatly assisted in contributing to the prosperous state of the company's affairs.

"It is the intention of the directors to continue this system under certain modifications. They have thought proper to give parties the option of purchasing their fittings in eight consecutive quarterly instalments, whereby it is expected that fresh applicants, who are found continually to present themselves, may be supplied with fittings without materially increasing the amount of capital already engaged in this department."

So well do I think of the system that I would strongly recommend all companies to adopt it. The amount of rental to be charged is quite immaterial, as the profit to be derived from the gas supplied by these fittings will be ample to cover any charges made upon it.

Gas companies, I am convinced, will find it to their interest to supply the necessary fittings at an annual rental or at the cost price. It will enable them to meet the calls made upon them for reduction of price, and will tend materially to promote the comfort and safety of the consumer. In Liverpool the fittings are supplied exclusively by the company, and the consumption of gas has been unequalled, and the present low charge for gas is the result. "Reduction of price increases demand, increased demand increases profits; increased profits, again, enable prices to be reduced; and again, reduced prices increase the demand, thus benefiting reciprocally companies and consumers." Remove the obstacles now existing to the use of gas in the cost of gas fittings, and this increased demand will be speedily brought about.

The merit has been awarded to me of being the originator of the system of supplying fittings at an annual rental. If having had it in operation in 1840, and having been the means of first making it public, which I did in the *Gas Gazette* of May, 1847 (by announcing the measure of the directors of the company of which I am engineer), entitle me to receive it, I can most conscientiously do so. The plan was then designated the "Devonport," to which it is fully entitled, for it would not have received that publicity but for the very liberal terms offered to supply pipes, fittings, meters, ventilating valves, gas stoves, and gas cooking apparatus, &c., at the rate of 7½ per cent. upon the cost. No other company has as yet, I believe, been equally liberal to their consumers; the selling price of gas at that time being 5s. per 1000 cubic feet.

The more prominent of the advantages to be derived from the supply of gas fittings by the company, either at a rental or by sale at first cost, may be stated as follows:—

It will very materially increase the demands for gas, and this, being created by the use of gas for domestic uses, will be found to have a beneficial effect, by causing a demand in the summer or season when gas companies generally have very little to do.

It tends to make more profitable the mains at present laid, by increasing the quantity of gas supplied by them; and this increase, it is presumed, principally arises after the places of business are closed.

By increasing the demand for gas it lessens the costs of manufacture, for the plant, mains, and officers of the company are not increased in proportion.

It removes the fears of the nervous, by the work being performed by the company's men, under competent direction.

By attention being thus given to the fittings, the working pressures can in most cases be reduced, and a saving in the leakage effected.

The company's gas-fitters can fix the meters, see to their efficient working, and take the indices when requisite, *thus* lessening the cost of inspectors.

It lessens the liability of opposition, and gets rid of the greatest opponents gas has ever experienced, viz., careless gas-fitters.

There are many others, but I have adduced enough to prove my case.

In conclusion, allow me to hope that your journal will meet that support which, being devoted entirely to gas and gas matters, it is incumbent on gas companies, their engineers and officers, to give to it; and I should be glad if it assists in breaking through that feeling of jealousy which unfortunately exists. I should like to see a portion of your pages devoted especially for the workings of those establishments who wish to see improvements in gas-lighting effected and carried out. Railway companies exchange working accounts and find an advantage in doing so. Why should not gas companies do the same?

A society of gas engineers would do much in generating a better understanding upon gas matters generally, and prove of advantage to all parties connected with gas-lighting.

THOMAS A. HEDLEY.

[We beg to express our thanks to Mr. Hedley for the above valuable communication, and more especially for the following report of the working of the establishment under his charge during the month of December, 1848, and which he is kind enough to promise to continue quarterly. We invite other returns of a like nature.—EDITOR.]

DEVONPORT GAS AND COKE COMPANY.

RETURN FROM MONDAY, NOV. 27, TO SUNDAY, DEC. 31, 1848.

Coals carbonized (Pearetb)	Tons. 373	Cwts. 17				Cwts.	Qrs.	lbs.
Coke made	255	8	Rate per ton of coals used			13	2	18
Coke used	102	0	,,	,,		5	1	23
Coke sold	116	10						
Breeze made	19	10	,,	,,		1	0	4
Breeze used	2	5	,,	,,		0	0	13
Lime used	222 Bushels		,,	About 1-3rd of a Bushel.				
Gas made	3,474,160 Cubic Feet		,,	9292 Cubic Feet.				
Gas used	3,462,608 Cubic Feet							
Tar made	3346 Gallons		,,	,,	About 9 Gallons.			

Number of Retorts fired 47
Ditto ditto charged 47
Ditto of Fires 7
Six-hour Charges.
Wages to Stokers, Purifying-men, Labourers, &c. . . . . £49. 11s. 3d.

Correct,
THOS. A. HEDLEY, Engineer and Secretary.
Correct Return,
JNO. WILLING, Clerk, &c.

ON COAL AND ITS PRODUCTS BY DISTILLATION.

Westminster, Jan. 17, 1849.

SIR,—It must be of considerable importance to those engaged in the manufacture of coal gas to be acquainted with the qualities of the different kinds of coal found in this country; and also to have those suited to their purpose classified and arranged in a tabular form, according to their respective values.

Government lately appointed a commission to analyze and report on the coal best suited to the steam navy. This investigation was entrusted to Sir H. De la Beche and Dr. Lyon Playfair; and it is evident from their first report that these gentlemen have devoted much care and skill to the task. It is, however, to be regretted that their instructions were not of a more extensive kind, so as to have embraced the relative values of coal when applied to general purposes, and more particularly to the manufacture of gas.

The present state of uncertainty in which this (as well as several other branches of our profession) is involved has frequently suggested to my mind the utility of the formation of a society of gas engineers, which might hold its meetings in various parts of the kingdom, and have the use of gas works (differently arranged) for experiments. The reports of such a society would be deserving of every confidence, and would, no doubt, be generally relied on,

The reappearance of a "Journal of Gas Lighting" has given me cause to hope that some advance may be made in this direction, by the facilities afforded of interchanging ideas and recording experiments. Having myself recently collected a few specimens of coal, with statements of the products obtained in practice, and having submitted them to analysis in a small apparatus, if you will lay your pages open to make those results public, and give a general invitation to others who are engaged in similar experiments to favour you with the results of their experience, some useful information will be the result.

It was my intention to publish these experiments in a separate form, but the announcement of your journal suggested to me the propriety of testing their accuracy by subjecting them to criticism.

Before entering upon a detailed account of the results, allow me to offer a few remarks on the nature of coal, its difference of composition, and the methods adopted in the analysis to determine the quality of the products.

All the varieties of coal with which we are acquainted, when resolved by chemical analysis into their ultimate particles, are found to be composed of carbon, hydrogen, nitrogen, and oxygen, with, in most cases, a slight mixture of sulphur, and sometimes iron and other metallic and earthy matters.

The names which have been generally applied to the different kinds have more reference to their external appearance, or to the particular locality in which they are found, than to their composition; and I will, therefore, for the sake of simplicity, divide them into two classes, viz., bituminous aud anthracite. This arbitrary arrangement will be useful, although there are some kinds which it might be doubtful at first to which of those two classes their places should be assigned.

The anthracite are those which, on being submitted to the process of distillation, yield neither tar nor gas, composed of hydrogen and carbon. Coal of this kind is, therefore, unfitted to the manufacture of gas, and is, in fact, similar in composition to the coke which is drawn from the retorts after the tar and gaseous matters have been expelled. It is with difficulty ignited, but gives out intense heat during combustion, and burns without flame or smoke.

It is supposed that coal of this description originally contained a portion of bituminous matter; but that, from the effects of spontaneous combustion or proximity to other inflammable matter, it has undergone a change. Indeed, coal of the bituminous kind may be rendered not only of the same composition by distillation, but, under peculiar circumstances, be made to assume the same appearance as the anthracite coal. Of this artificial *anthracite* several specimens may be seen at the Economic Museum, Charing-cross.

The explosions caused by the production of inflammable gas, and its subsequent mixture with atmospheric air, in coal mines, are frequently to be attributed to this gradual decomposition, which is even now continually going on, and renders the working of some mines of coal extremely hazardous.

This coal is found in South Wales and in many parts of Ireland. That from the county of Kilkenny is reported to be the purest, and is certainly the most beautiful in appearance. Several specimens have been analyzed by the Government commission; the results of two of which I will give to illustrate their composition:—

FIRST.—ANTHRACITE COAL, FROM JONES AND AUBERY, PARISH OF LLANGENNACH, GLAMORGANSHIRE.

Proximate Analysis.

Specific Gravity.	Coke.	Tar.	Water.	Ammonia.	Carbonic Acid Gas.	Sulphuretted Hydrogen.	Olefiant.	Other Gases.
1·37	92·9	None.	2·87	0·20	0·06	0·04	Query	3·93

Ultimate Analysis.

	Carbon.	Hydrogen.	Oxygen.	Nitrogen.	Sulphur.	Ash.	Per cent Coke left.	Per Cent. volatilized Matter.
	91·44	3·46	2·58	0·21	0·79	1·52	92·9	7·1

SECOND.—ANTHRACITE COAL, FROM SLIVARDAGH, COUNTY TIPPERARY.

Ultimate Analysis.

Specific Gravity.	Carbon.	Hydrogen.	Oxygen.	Nitrogen.	Sulphur.	Ash.	Per cent Coke left.	Per Cent. volatilized Matter.
1·59	80·03	2·30	Included in Ash	0·23	6·76	10·80	90·1	9·9

By referring to the above table, it will be seen that neither tar nor hydrocarbon gas could be obtained from this specimen of Welsh anthracite; and, although the Slivardagh coal was not tested in this way, it is clear, from its composition, that it could contain none, for the carbon, 80·03, added to the ash, 10·80, would have gone to make coke 90·83 per cent., being nearly the same as in the former instance.

This species of coal having been alluded to for the purpose of contrasting it with the bituminous kind, which is alone useful to the gas manufacturer, I will now proceed to an examination of the latter without further comment.

Of bituminous coal the varieties are numerous—some of them containing above one-half of their weight of bitumen, while others contain so very little that, for practical purposes, they may be classed with the anthracite, which contains absolutely none. Between these extremes there are varieties containing every intermediate proportion of bitumen, and likewise differing from each other in the amount of their impurities.

As a general rule, the value of coal for the production of gas may be taken directly as the quantity of bitumen it contains, or, inversely, as the weight of coke left in the retort after carbonization, provided always there is no difference in the impurities.

In the process of distillation, bitumen may be disposed of in three different ways. It may either be converted into permanently elastic vapour, that is hydrocarbon gas, or, having been volatilized, become condensed into tar and essential oil, or the hydrocarbon gas may leave in the retort a portion of its carbon in the solid form; and it is to the different quantities of those beforenamed substances produced by the modes of treatment adopted to which must be attributed the widely-differing results obtained by practical men.

The coal which yields the greatest amount of illuminating matter with the least residue of coke, so far as my experience goes, is Lesmahago cannel, from Lanarkshire, Scotland. From this kind I have obtained in a small experiment at the rate of 483 lbs. of gas from one ton of coal. This quantity agrees very nearly with the result of Dr. Fyfe's experiments. Although he has not stated the weight of gas obtained, it may be calculated by the quantity and specific gravity.

I do not know of any coal used by gas companies which yields less than 250 lbs. of gas per ton of coal. Those, therefore, that do not yield that quantity may very properly be left out of this examination as unfit for gas purposes.

As the very great importance which I attach to the weight in pounds of gas obtained from a given weight of coal, and the introduction of that as a standard of value, is in some degree novel, I will give a few reasons for the introduction of such a mode.

I believe that Mr. Samuel Clegg was the first who directed attention to the fact, that the illuminating power of hydrocarbon gas was in direct proportion to its weight. If this principle can be shown to be correct, the advantages that will result from it are great; for it will be admitted that all photometric experiments depend entirely on the human eye, and that it is impossible for various reasons to define the illuminating power to any degree of accuracy; whereas the weighing of gas has now become so simple an operation, and capable of such a degree of refinement, that no two experiments can disagree on it.

My own observations go to prove that Mr. Clegg is substantially correct, with this slight amendment, which has been suggested by my experience, and which will appear evident upon examining the composition of hydrocarbon gas, viz., that the illuminating power of gas is directly as the specific gravity, but in an increasing ratio; thus one cubic foot of gas of sp. gr. ·500 will produce more light than two feet of gas of ·250.

I have found that when pure gas of specific gravity ·360 is burned from a round hole about $\frac{1}{8}$ of an inch in diameter, or from a fish-tail burner, the light being reduced till exactly equal to that of a sperm candle, burning 120 grains per hour, their respective illuminating values are, weight for weight,—gas, ·7; sperm, 1·; when, however, the gas has a specific gravity of about ·500, and is burned against sperm in the same way, their values are nearly equal, that is, 1 lb. of gas at ·500 specific gravity is equal to 1 lb. of sperm; it will, however, require many experiments to settle the exact rate of progression between those two points.

It has been urged against the specific gravity test, that carbonic acid gas, ammonia, and watery vapour, may materially interfere with its accuracy. This objection is, however, more speculative than practical; for in the many specimens which I have tested in England I have not found sufficient quantity of either in any gas to interfere materially with its weight.

The watery vapour is entirely regulated by the temperature and pressure, and can easily be allowed for, while the ammonia, even when no means other than the condenser have been taken to remove it, does not exceed one two-thousandth part of the whole bulk; and so sensitive is the turmeric test of the presence of any thing approaching to this quantity, that it is instantly detected by the change in colour from yellow to deep red.

That which is more likely to affect the weight is carbonic oxide, and this gas is sure to be present, less or more, when gas is made from coals, into the composition of which much earthy matter enters. This gas is not absorbed by passing through lime, as is carbonic acid, and errors from its presence should be carefully guarded against.

For these reasons I will, in the following experiments, rely principally on the specific gravity as a test for the *minute* differences between gases, taking care to check it by their composition and the comparative amount of light given out by each; and, besides giving the quantity of gas obtained and its specific gravity, I will also deduce its weight in lbs., whereby the value will be seen in a simple instead of a complex form.

The mode of reducing the gas into lbs. is to multiply the quantity of gas in feet by its specific gravity, which, it is obvious, will give the number of cubic feet of air equal in weight to the quantity of gas; and as it is known that 13·28 feet of air weigh 1 lb. avoirdupois; dividing by that number, the quantity of lbs. of gas will be the result; or if, instead of dividing by 13·28, the sum is multiplied by the reciprocal ·0753, it may be arrived at by an easier method.

I have depended upon two photometers—Count Rumford's, by means of shadows, and that which is known as King's photometer, by a balance of light on oiled paper; and, as the amount of light given by a gas is frequently dependent on the kind of burner used, I have preferred, in all cases, to burn the gas through a round

hole one-eighth of an inch in diameter, reducing the flame to the size of a sperm candle, burning 120 grains per hour. But, as the sperm candle does not afford a steady equal light, I have rather taken the value of it in gas; that is, 1 foot per hour of gas, specific gravity ·360. Although by this system the gas is not consumed to the greatest advantage, it shows the *relative* value of gases better.

Having in those necessary preliminaries given my views as to the principles upon which such experiments should be conducted, I will now proceed with the experiments themselves, beginning with the Lesmahago cannel before alluded to.

This coal is obtained in large masses, is very hard, and breaks with difficulty, but may be split with a hatchet into thin sheets, and afterwards broken into pieces convenient for carbonization. It is of a black-grey colour, with shining yellow particles on its surface, having more the appearance of stone than coal, and was, when first found, used for macadamizing the roads, until its value was discovered. Yet the demand for it has been so great that about two years ago it was sold as high as 25s. a ton in the neighbourhood of the pits; and the present price is still about 18s. per ton.

When introduced into the retort it emits a crackling sound, and sends forth volumes of smoke. Its specific gravity varies from 1·207 to 1·252, that which has the straight fracture being the heavier, while the curly pieces are lighter, and are said to yield less gas. The coke made from it has the appearance of the charcoal produced from old wood; it is of a very light character, leaves a white ash when burnt, and is quite unfit for smelting metals; its specific gravity is ·800, when due allowance is made for the water absorbed during immersion.

The quantity of gas obtained in practice from one ton varies from 9000 to 10,000 cubic feet, the specific gravity of which ranges from ·630 to ·640. In the summer of 1847 I found it of this weight, both in Glasgow and Dundee, but I am inclined to believe that not more than 9000 feet of gas per ton of this density could be made in practice. If the quantity is increased beyond this point the specific gravity is reduced by the deposition of carbon in the retort, and there is less illuminating matter in the increased quantity.

It has been asserted that as much as 17,000 feet per ton can be made from it, and the late Mr. Hedley was witness to a feat of this kind performed by a gentleman in Ayrshire. I have no doubt of the truth of the assertion, but it could only be done by passing the gas over red-hot surfaces, and thereby decomposing the heavy gas, a double volume being obtained by the deposition of carbon. In the 17,000 feet obtained by this method there would be less illuminating matter than in the 9000 feet obtained in the usual way; more fuel would also be required during the process, and for these two reasons it would not be economical. As this is the most glaring instance I know of wherein quantity of illuminating matter was sacrificed to bulk of gas, a fault too common among engineers of the present day, I take this opportunity of laying down what I think should be an axiom, viz., that, when the greatest number of lbs. weight of illuminating matter (irrespective of volume) is obtained from a given weight of coal at the least expense of fuel, the economic acme in the distillation of coal is obtained.

From the many experiments I have made on 1000 grains of this coal I will select two to show its composition, and also that when the quantity is increased beyond a certain limit the whole weight of gas is decreased.

To render this view practical I have calculated the results for one ton.

LESMAHAGO CANNEL.

Per Ton.

First Experiment.	lbs.	Second Experiment.	lbs.
Coke	1091	Coke	1064
Gas	463	Gas	483·5
Tar	594	Tar	603
Ammonia and water	4·5	Ammonia and water	4·5
Loss	87·5	Loss	85
	2240·0		2240·0
Cubic feet of gas	11,681	Cubic feet of gas	9878
Specific gravity	·540	Specific gravity	·650
		Illuminating power, gas at .360 being 1·	2·33

There are, no doubt, many seams of cannel coal in Scotland which approach near to this, and form, therefore, a connecting link between that and the next sample which I have chosen—Ramsay's Newcastle coal. This coal, although nearer to the Lesmahago than any I have found in England, is very different in appearance and construction; indeed, so peculiar is its nature, that I believe experimentalists will be likely to disagree in their reports concerning it.

It has a black, pitchy appearance, more like the Wigan cannel, but not so bright in its surface, and has a greyish tint, which does not belong to that coal. It is softer than the Scotch cannel, does not, like that when undergoing carbonization, open into minute slits to allow the gaseous matter to escape, but dissolves into a semi-fluid state, the resulting coke having somewhat the appearance of baked tar. The gas from it has a sp. gr. of ·604; but upon standing for twenty-four hours I found it reduced to ·588. I am inclined to think from this, and also from the quantity of tar deposited in the lime purifier, that there is given from it a good portion of tar, which, cooling alone, will not take from it.

It is also remarkable, like the Lesmahago, for the small quantity of water and ammonia it contains, 1000 grains of coal yielding only 3 grains of ammonia water, even when not dried to expel hygrometric water. The results I have obtained in several experiments are:—

RAMSAY'S NEWCASTLE CANNEL.

Per Ton.	lbs.	Per Ton.	feet.
Coke	1435	Gas	9016
Gas	410	Sp. gr.	·604
Tar	295	Illuminating power, gas at ·360 being 1·	2·
Water and ammonia	6·72	Sp. gr. of coal	1·29
Loss, supposed to be tar in mouth-piece, &c.	93·28		
	2240		

I wished to have been able to have given next the Wigan cannel, but, as my experiments upon this are much different to many excellent experimenters as well as practical men, I am afraid the specimens I have are not genuine, as I have not been able to produce more than 350 lbs. of gas from a ton. I will, therefore, reserve that until next number, and conclude with ihe Derbyshire deep main, which has no pretensions to rank in this place, but may be put as a contrast to the foregoing specimens.

This coal has a great deal of earthy matter in its composition, which deteriorates the coke produced from it, and also, I believe, tends to render the gas heavy, by evolving carbonic oxide, whereby one of the exceptions is formed to the sp. gr. test.

DERBYSHIRE DEEP MAIN.

Per Ton.	lbs.	Per Ton.	feet.
Coke	1335	Gas	9400
Gas	300	Sp. gr.	·424
Tar	219	Illuminating power, gas at ·360 being 1·	·8
Ammonia and water	179		
Loss	207		
	2240		

In operating upon small quantities of coal, it must be borne in mind that more gas and less coke is given them in practice, to the extent of, perhaps, 10 per cent.

A. WRIGHT.

COAL TAR.

A correspondent desires us to state, in reply to the question of Mr. Radley's, in one of the numbers of the *Gas Gazette*, "whether the entire of coal tar is volatile," that he has experimented upon it, both in an intensely hot furnace and by the action of the blowpipe, and the result is an indestructible residuum of a greater specific gravity than iron.

Register of New Patents.

RICHARD BARNES, of Wigan, Lancashire, gas-engineer, for "*certain improved apparatus for manufacturing gas for illumination; part of which improvements is applicable to retorts for distilling pyroligneous acid, and other similar purposes.*" Granted June 6; enrolled December 6, 1848.

This apparatus is intended for the manufacture of gas in a small way. The stove is built of firebrick, with openings in the front or side, but without grate or bars. The retort is suspended in the stove by its flanges, which rest upon horizontal iron supports let into the brickwork, and to which is attached a circular iron plate, standing upwards. The cover is formed with two rims, one within the other. The inside one takes into a groove formed by the projection of the retort above the flanges and the circular iron plate, while the outside rim dips into another groove, filled with water, and supported from the brickwork of the stove. The circular iron plate passes up between these two rims, so as to intercept the radiation of heat from the inside one, and consequently to prevent the evaporation of the water which is contained in the groove in which the outside rim dips. The tar, &c., which drips from the cover between the projection of the retort and the inside rim, together with the water-joint, prevent the escape of gas into the atmosphere.

Inside the retort is the cradle for holding the coal from which the gas is to be evolved. The gas passes from the retort, through a pipe fitted into the cover, into the refrigerator, the hydraulic main, the condenser, the wash-vessel, the purifier, and lastly into the gasometer. The gasometer contains the purifier, the advantage of which arrangement is, that the gas is constantly exposed to the action of the lime. The gas, as it is evolved, passes through the apparatus into the gasometer; and when the coal is exhausted the cradle is taken out, and placed in an extinguisher, so constructed as to prevent the admission of air to the coke, and also the escape of noxious vapours from it.

The patentee claims the constructing the stove with openings in front or in the sides, but without grate or bars, and in closing the mouth of the retorts used in the manufacture of coal gas, or pyroligneous acid, or other similar purposes, by a cover made gas-tight by a water-joint. Also, the peculiar construction and general arrangement of refrigerator, condenser, wash-vessel, purifier, and gasometer, as described.

CHARLES RICKETTS, for "*Economic Gas Cooking Stove.*" Registered Jan. 13, 1849.

FIG 1.

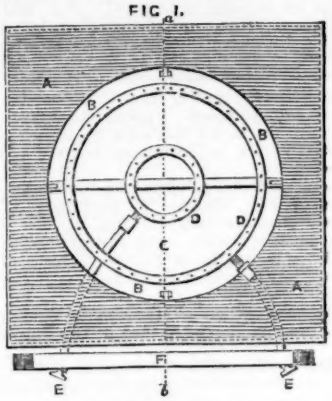


FIG 2.

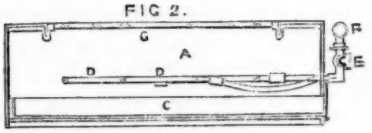
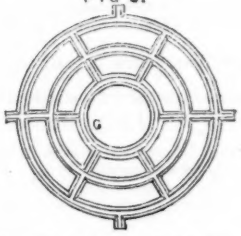


FIG 3.



DESCRIPTION.—Figure 1 is a plan of this gas cooking apparatus, with the top trivet or meat support G removed. Fig. 2 is a section on the line *a b* of Fig. 1, and Fig. 3 a plan of the trivet. AA is a shallow frame or box made of thin plate, out of the top of which there is cut a circular aperture BBB. C is a drawer of tinned plate, which receives the drippings that fall from the meat in the course of cooking. DD are two ring burners, each of which is provided with a separate stopcock E, so that either one or both may be used at the same time. F is the gas supply pipe. G is a trivet composed of three concentric rings, which serves *a* the support for meat or utensils used in cooking. The inner and outer rings of this trivet occupy a position immediately over the ring burners, and have their sides inclined at angles to the top surface, as shown in the section Fig. 2, so that the drippings from the meat or liquid from the utensils used in cooking, are prevented from falling on and stopping up the apertures in the ring burners DD.

WILLIAM EDWARDS STAITE, of Lombard-street, City, gentleman, for "*improvements in the construction of galvanic batteries, in the formation of magnets, and in the application of electricity and magnetism for the purpose of lighting and signalizing; as also a mode or modes of employing the said galvanic batteries, or some of them, for the purpose of obtaining chemical products.*" (Partly a communication.) Granted July 12, 1848; enrolled January 12, 1849. [Reported in the "Patent Journal."]

The great leading feature of this invention being the batteries, they obviously form the first part of the specification; the system pursued throughout being what he terms the "perfluent" system, in contradistinction to the percolating batteries—the unequal reduction of the plates by these (as well as every other kind of battery), besides the constant attention required, rendering them all more or less troublesome and expensive in their action. Now, by the proposed system, the consumption of the metal is equalized, and the exciting fluids may be regulated so as to effect the necessary change to ensure the continued action of the battery, without other attention than may be periodically determined, and which may be extended to a considerable time. These batteries are, in their general arrangements, very similar to the ordinary acid battery; each separate cell is furnished with two openings at bottom, at opposite ends of the cell, which communicate with short longitudinal channels under the battery, which connect one cell with that next it on one side, while the opening or channel at the other end of the cell communicates with the adjoining cell on the other side; and in this order the whole series are in communication. The under channels, leading to the end cells of the battery, have a hose attached thereto, which are carried up to the level at which the liquid is to stand in the battery, and terminate in two funnel-heads, the one having a spout to run off the excess of the liquid into a suitable receiver, while the other is being continually replenished from the supply-cistern; the height of this funnel being sufficient to cause the liquid to flow through the battery, passing first to the cell next that end in which it circulates, then to the next in succession by channels before mentioned, and so on through the whole series. Modifications of this battery are represented, in which only one opening is made in the bottom of each cell, and all communicating with one channel. A hose-pipe is attached to this, the funnel-head of which is raised and lowered at intervals of about twenty minutes, for the purpose of running off or replenishing the liquid, which is thus equalized throughout the whole number of cells. Instead of the cells being connected at alternate ends, as first described, syphons may be employed for passing the fluid from one to the other. In another arrangement the perfluent system is shown in connection with a double or porous cell battery (the inner cell being a porous jar) supported in the centre of the outer cell on a pipe passing through the bottom of the battery, and furnished with washers of indiarubber, to prevent the liquid escaping from one cell to the other; or at the bottom this pipe forms a communication with an under supply-channel, in which the proper feed is maintained in a hose and funnel-head, at the proper level; and, supposing the exciting liquid to be a solution of sulphate of lead, it becomes specifically lighter while it remains in the jar, and becomes a clear solution of dilute sulphuric acid. This is allowed to flow over the edge of the porous jar into the outer cell, or zinc compartment of the battery; here it escapes by an aperture in the bottom to a channel common to all these cells, and from thence carried away by it at a height suitable for maintaining the proper level in the cells.

The second part of the invention alludes to an apparatus for regulating the supply of the exciting fluids to galvanic batteries. The liquid is contained in a cask or other suitable cistern, enclosed at top to prevent the pressure of the atmosphere acting on the surface of the liquid, which is drawn off at an opening at the bottom, and received into a small open cistern, the level of the liquid in which, when above the opening in the cask, prevents any further escape; from this small cistern the liquid is drawn by means of a syphon; the end pendant thereon is a flexible hose; while the other, or long end, is a metal tube, which delivers the liquid into a glass tube or vessel, from which it escapes by a small aperture at the bottom, which is regulated to pass about the necessary quantity; when the liquid rises to a higher level in the glass tube, and consequently covering the long end of the syphon, which passes down to the bottom, the flow will be diminished, at the same time the higher level attained will indicate a greater outflow at the bottom; the outer side of the glass being graduated accordingly. The syphon is suspended by a cord, by which the relative proportion of the legs may be varied by elevating or depressing the level thereof, the long end always remaining the same, while the flexible material of the other adapts itself to the required height at which the apparatus may be suspended.

Thirdly, this invention relates to combination of lead as the positive element with nitric or acetic acids, instead of zinc, and having any suitable negative element; the plates for which purpose may advantageously consist of surfaces of platinum.

Fourthly, to the employment of an amalgam of zinc, enclosed in a bag, as a substitute for the amalgamated zinc plates or rods used in galvanic batteries. For this purpose he employs a bag of linen, hair cloth, or any finely-reticulated fabric not metallic, in which the amalgam (in a liquid state) is placed, in which state it is used in lieu of the plates before mentioned.

Fifthly, to improvements in the formation of magnets, which consist, first, in the hardening such articles by heating them in a bath of hot metal, instead of subjecting the magnet to the heat of a furnace, and afterwards plunging them in water, lead being employed as the heating medium.

The metal he uses in the formation of magnets for electrical purposes he prepares as follows:—He takes the best Swedish iron, and, instead of converting the whole into steel, as usual, he only partially converts it to the thickness of the scale on the outside; this scale is removed, and afterwards fused and the ingot obtained, and then rolled out into thick sheets, from which the magnets are cut.

The sixth part relates to an improved galvonometer; in the galvanometers hitherto employed they have been useless when the electrical apparatus has been in action, as they cannot be used during that time, while the present improved galvanometer is included in the circuit, and shows at all times the intensity of electricity passing. It consists of a thick wire coiled round a hollow wood centre, in which a glass tube is fixed, in the centre of which is placed a rod of soft iron, so as to slide freely up and down in the centre. This is surmounted by a small stem of brass; the passage of the current through the coil tends to draw the soft iron rod upwards, the height to which it is elevated depending on the intensity of the current; the glass tube is graduated to show in units the number of grains of pure zinc consumed, which may be effected by the actual experiment, or it may be graduated according to one of Petric's galvanometers.

The seventh part relates to an amalgam consisting of zinc and mercury, in the proportion of five parts of the former to one of the latter, when employed as plates or rods in galvanic batteries.

The eighth part of this invention has reference to improvements in effecting the motion of the electrodes in electric lamps, employed for the purpose of producing a continuous light for illuminating purposes, or for the production of a regular intermittent light, applicable to lighthouses. The improvements in this particular consist of an apparatus for elevating the electrode as it is consumed or transferred to the opposing electrode by the passage of the electricity, and is an improvement on a former patent, dated July 3, 1847. In this case the supporting stem of the lower electrode terminates at the lower end in a rack, which gears into a pinion, on the axis of which is placed an escapement-wheel, worked by means of a double pall, one of which drives the wheel in one direction, while the other propels it in the opposite direction.

This double pall is pivoted in the centre (the opposite ends being the parts that fall into the teeth) to a lever, one end of which has a slow oscillatory motion communicated to it from a crank, actuated by a train of wheelwork, the motion of which is maintained by springs, or some suitable maintaining power, and the direction of motion given to the wheel will depend upon the pall in gear; this is deter-

mined by what he terms a regulator-coil; this regulator-coil is placed in the circuit producing the light. A rod of soft iron is placed in a vertical position in the coil, the upper part of which terminates in a wooden top attached to a long lever, which is elevated or depressed by the vertical rod, according to the intensity of the current of electricity. The long lever has near its fulcrum a small stirrup, embracing one of the palls, so that when it is elevated it withdraws that pall from the wheel, and throws the other into gear; this will take effect when the lower electrode has been elevated too far, or brought into too close contact with the opposing electrode, and will, consequently, reverse the direction of motion of the wheels, and lower the electrode; and, again, when it sinks too low, the palls will be reversed, and thereby raising the electrode to a position more compatible with the production of light. When the electrodes are in a position the best suited for the production of light, a small catch on the regulator-rod lever comes in contact with the crank movement, and prevents the further action thereof; but so soon as this lever is elevated or depressed by the regulator-coil, so will an upward or downward motion be imparted to the electrode. Suitable counter-balances are attached to the several parts, to ensure their proper action. By this means a continuous and uniform light is obtained, applicable for general purposes of illumination. The upper electrode is secured in a tripod, one of the legs of which forms the conducting link, and is immediately connected with the regulator-coil before mentioned, and forming the eduction for the electric current, the induction being effected through the rack to the lower electrode.

In the pro luction of an intermittent light, the supporting stem of the electrode is furnished with a rack, gearing into a pinion, in connection with a train of wheelwork and a suitable flyer, to regulate the motion; this pinion is so fitted as to have about one-tenth of an inch of back-lash, and is free to receive an impulse from the rack. The lower end of the stem terminates in a rod of soft iron, surrounded by a helix-coil contained in the electric circuit. This is influenced by the current so as to draw down the electrode, the wheelwork before mentioned giving way thereto and allowing it to be slowly withdrawn, so that when the electrodes are at too great a distance apart the light becomes extinguished, and the influence of the coil ceases. A weight hung over a pulley is suspended by a cord from the rack or support-bar of the electrode, which—so soon as the influence of the coil ceases—begins to elevate the lower electrode, until it comes in contact with the upper electrode, and thereby establishing the electric circuit; and the influence of the coil being again brought into action, the rack-bar is slowly drawn downwards, as before explained, till the light becomes extinct—the flyer in gear with the rack limiting the speed of either movement, producing thereby a regularly intermittent light, the duration of the light and the succeeding intervals of darkness depending upon the apparatus employed. A chain is attached to the raising weight, one end of which rests on the pedestal of the apparatus; and as the electrode is reduced a greater portion thereof is deposited on the resting-place, and so keeps the whole in a proper state of equilibrium. Other arrangements are represented for producing an intermittent light, in which the rack and wheelwork is omitted, thereby allowing the flashes of light to be produced in rapid succession; but this may be readily arranged to limit the duration of light or darkness, as may be required. In one of the lamps shown the upper electrode consists of a rotating disc, having an angular periphery, the apex of which forms, as it were, the point of the electrode. This is connected with suitable wheelwork, which causes it to rotate slowly, or about one revolution an hour. A scraper is placed in contact with the periphery of this disc, which removes at each revolution the particles of matter transferred from the lower electrode, and by this means maintaining a permanent point to the electrode.

The eighth part has reference to the making of electrodes of electric lamps of iridium, the hardest of all known metals; or of alloys thereof. For this purpose he fuses the oxide iridium by enclosing it in a cupel of boneash under the influence of the voltaic arc, which produces the most intense heat known. The resulting ingot is afterwards subjected to heat for a considerable time, and hammered for the purpose of annealing it and forming as near the shape as possible, when it is completed in the manner of cutting precious stones by the lapidary's wheel. These electrodes are shown in a shape assimilated to that of a horseshoe, and mounted on two glass supports from the base of the lamp, with which the current wires are in suitable connection; the whole is under a glass shade, the light being produced by the passage of the electric fluid through the iridium. Combinations of these electrodes are represented under the same shade for the production of a more intense light.

The ninth part refers to the encasing of electrodes in supporting tubes, by which the electrode is protected from fracture, and also admitting of the electrodes being made of several pieces, and joined end to end. This supporting tube rises nearly to the top of the electrode, and is surmounted by a number of erect springs, which surround the electrode, and hold it firmly after it passes out of the tube end; these springs are fitted to the top of the tube by a sort of a bayonet-joint. The electrode, or pieces forming the electrode, are joined by insertion the one into the other, and secured by a suitable cement, the top of the under one forming a cup for the reception of a pin formed on the lower end of the upper portion.

The tenth part relates to the introduction of an intensity-coil in the electric circuit of galvanic batteries, for the purpose of increasing the intensity of the fluid. This consists of a copper-wire ribbon, wound and retained in a suitable coiled form, through which the current is passed when applied to the purposes of lighting, or for motive purposes. This copper ribbon should be a cross section of an area of one-tenth of an inch for every forty yards in length.

The last part of this invention relates to the production of chemical products from galvanic batteries, either used for the production of light or heat, for motive power, or for the production of such chemical products only. For this purpose, one or other of the perfluent systems of battery should be employed, from the facilities afforded for drawing off the products. In the case of zinc being used as the positive element, the sulphate of zinc will be the result; but, as the sulphate of zinc is of little or no commercial value, he further prepares it by adding thereto a solution of the sesquicarbonate of ammonia, which will precipitate the oxide of zinc, and the acid, being thus freed from the zinc, may be used again in the batteries, while the oxide of zinc may be employed in place of the carbonate of lead, so extensively used as a pigment. Various other results may be obtained, according to the metals and acids employed in the batteries, several of which are given in illustration, but which it will be unnecessary to enter into.

First: The construction of galvanic batteries on the perfluent principle, before explained; whether the perfluence of the liquid is effected by intercommunicating channels at the bottom of the trough, or by syphons at the top, or by any other equivalent means.

Secondly: The employment in galvanic batteries of flexible hose, with funnels attached thereto, for the purpose of charging and discharging the cells.

Thirdly: The construction of the double fluid battery, before described, so as to cause the perfluence of two separate and distinct exciting fluids.

Fourthly: The graduated meter attached to the supply-tub or cistern, in order to regulate the quantity of the exciting fluid which may be required to pass through the battery.

Fifthly: The equilibriated hydrostatic supply-cistern, as adapted to galvanic batteries.

Sixthly: The combination of lead (instead of zinc), as the positive element, with any suitable negative element having nitric acid as the exciting fluid, in galvanic batteries.

Seventhly: The mode described of enclosing a liquid mercurial amalgam of zinc in a bag of linen, horsehair cloth, or other finely-reticulated fabrics, and to be used instead of the amalgamated zinc plates or rods of galvanic batteries.

Eighthly: The employment of an amalgam of zinc and mercury, in the proportion of five of zinc to one of mercury, in galvanic batteries.

Ninthly: The several improvements described in the formation of magnets.

Tenthly: The improved regulator for electric lamps, as described.

Eleventhly: The improved galvanometer and graduated scale, before described.

Twelfthly: The several improved modes of actuating the electrodes in electric lamps, before described.

Thirteenthly: The method described of making the electrodes of iridium, or alloys of iridium, and used for the purpose of producing electric light.

Fourteenthly: The encasing the electrodes of electric lamps in tubes, for their support, and the making them in pieces, as before explained.

Fifteenthly: The insulation of the said electrode tubes from the metal stand which supports the lamp, so as to allow of two or more separate lights being worked with separate currents of electricity, independently of each other, but sufficiently near to be worked under one glass shade.

Sixteenthly: The revolving circular electrode, with conical edges, in combination with a scraper, for removing the particles of matter transferred from the one electrode to the other.

Seventeenthly: The employment in electric lamps of glass, or some similar imperfect conductor of heat, to envelope the metallic apparatus for holding the electrode.

Eighteenthly: The combination of an intensity-coil with a galvanic battery, as before described.

Nineteenthly: The several arrangements for producing the regularly intermittent light from electricity, for the purposes of illumination in lighthouses, together with the various modifications by which the same may be adapted to the production of a permanent light, as described.

Twentieth, and lastly: The formation of galvanic batteries for the purpose of obtaining chemical products from the several combinations of galvanic elements and exciting liquids, herein mentioned.

Joseph Clinton Robertson, of 166, Fleet-street, London, civil engineer, for "*improvements in the manufacture of gas for illumination, and of the residual products into articles of commerce.*" Patent dated July 6, 1848. (Communicated from abroad.)

Firstly: The gas for illumination is manufactured in manner following from rosin, in conjunction or combination with potash and lime, or soda and lime, or potash, lime, and soda, or any one or two of the said substances, in combination with any other alkaline substances, one, two, or more, and in conjunction also with sawdust or any other fibrous vegetable matter, in a finely comminuted state. These crude materials are mixed together (in proportions for which no specific rules are given, as almost any combination of them is productive of a beneficial result), and placed in moveable cast-iron cases, of a cylindrical or any other form adapted to the shape of the retort in which their distillation is to be afterwards effected, which cases are permanently closed at one end, and have at the other end caps, covers, or plugs, which are fitted to them loosely, so as to be easily driven off by a little external pressure. These cases are placed in a retort precisely similar to an ordinary gas retort, and set like it in brickwork; and they are so arranged as to leave room for the escape of the caps, covers, or plugs when driven off, as aforesaid. This retort being heated in the usual way, the resulting volatile or gaseous products are conveyed by a tube into a second retort of the same description as the first, filled, or nearly so, with lumps of coke or lime, or broken brick, or other like materials in a fragmental state, in order that they may present a large decomposing surface, and heated to a cherry redness previously to the introduction of the gaseous products. If only a very pure gas, for purposes of illumination, is desired to be obtained, the

gas which escapes from the second retort is made to travel through a third or fourth retort, filled with materials of the same description, and in the same incandescent state as those used in the second. But,

Secondly: When it is desired to separate and collect the oil or oleaginous matters held in suspension by the gaseous products resulting from the distillation in the first retort, these gaseous products are passed through a close tank nearly filled with water, and fitted with an ascension-pipe that leads to a hydraulic main, such as is in ordinary use in gas manufactories. The water retains the oil or oleaginous matters, or at least the larger portion thereof, while the gas which passes off to the hydraulic main is conveyed thence to a water-washer, passed next through a dry lime or milk of lime chamber, and finally transferred to a gas-holder.

Thirdly: From the oil obtained in manner aforesaid an artificial grease of a superior quality is made, by mixing it with milk of lime or dry lime, and adding a quantity of zinc, or some one or other of the alloys of zinc, reduced to a granulated state in the proportion of about five parts of zinc, or alloy of zinc, to each hundred parts (by weight) of the oil.

Fourthly: From the same oil there is obtained a spirit, which may be used both for illumination and as a varnish or vehicle for colours, by distillation and rectification. In first distilling the oil, care is taken not to raise the temperature higher than is just sufficient to give the oil, which is originally of a yellowish colour, a brownish or tawny appearance. The spirit which comes over from this first distillation is afterwards rectified by redistilling it once, twice, or oftener, in combination with a small quantity of lime, in each instance, until it attains any required degree of whiteness. The proportion of lime to spirit which is found to answer best in practice is about three-quarters of an ounce of the former to each pound weight of the latter.

Claims.—1. The manufacture of gas, for illumination, from rosin, by mixing it with alkaline and vegetable fibrous substances, and exposing these crude materials to the action of heat in cases placed in retorts, and passing the resulting volatile or gaseous products through retorts, one, two, or more, filled with lumps of coke or lime, or broken brick, or other like materials in a fragmental and incandescent state, as before described.

2. The separation and collection of the oil or oleaginous matters contained in the volatile or gaseous products resulting from the first distillation of the said crude materials, by passing the same through water, as before described.

3. The manufacture from the said oil of an artificial grease, by the admixture of lime and zinc, or some alloy of zinc, as before described.

4. The manufacture from the said oil of a spirit, by the process and the means before described.

Chevalier Alexandre Edouard Lemolt, of Conduit-street, Middlesex, for "*certain improvements in apparatus for lighting by electricity, parts of which may be made use of in other applications of electricity.*" Patent dated July 20, 1848; enrolled January 20, 1849.

This invention relates to improvements in electric piles, which consist in the use and application of a new element in electric piles and other appliances connected therewith; secondly, the application of two discs of carbon as electrodes, for the purpose of producing an electric light, which discs are caused to approach each other by suitable mechanism, so as to maintain the same relative distance between the peripheries, in order to obtain a continuous light.

First, with regard to the new elements for the production of electricity, it is well known in the manufacture of gas, by the destructive distillation of coal, that a hard carbonaceous deposit takes place on the interior of the retort; this it is only necessary to remove, and cut or shape it in suitable plates of which to compose the battery, it not being necessary that this carbonaceous deposit should undergo any further operation. The plates of carbon are suspended within two porous jars, which again are enclosed by cylinders of amalgamated zinc. The plate of the one jar is put in connection with the zinc cylinder of the other by strips of metal, and, in order to render the attachments thereof permanent, the patentee electrotypes the ends of the plates with copper, or some such metal as will admit of securing the straps by solder, while at the same time the opposite ends are similarly attached to the amalgamated zinc cylinders, and further secured by riveting, thereby preventing the possibility of any of the series becoming detached while the battery is in operation; the whole are enclosed in a suitable earthenware jar, for the purpose of containing the acid: when the batteries are intended for removal these jars are furnished with a return lip, which prevents the acid being thrown out. The patentee uses nitric acid for the inner or porous jar, while in the outer jar dilute sulphuric acid (about seven parts water to one of acid) is placed. The action of this description of apparatus is so generally understood as to render further description useless. Instead of cutting the plates of carbon from the mass, as before mentioned, the patentee prepares them by combining other matters with it, in which case this carbonaceous matter must be in a comminuted state. To three parts thereof, by weight, the patentee adds one part of pounded coal, coke, or charcoal, together with one part of coal tar; these are to be intimately mixed, when they will be of such a consistency as to be readily capable of being formed into the requisite shapes for the plates or carbon elements in suitable moulds, in which they are to be compressed by means of an hydraulic or other press calculated to produce the requisite degree of pressure; by this means they will be reduced to a hard compact state. The plates or blocks so formed are then removed from the moulds and exposed to the atmosphere in the shade, for two or three days, to evaporate the moisture; they are now to be subjected to heat for about thirty-six hours, and their temperature is gradually raised to a light red heat, when they are allowed to cool as gradually as they were heated; they may then be applied as an element in electric piles, the one end being electrotyped as before explained, for the purpose of effecting the permanent metallic connection.

Another part of this invention refers to the coating of one side of the zinc plates, or the amalgamated cylinder of zinc, which has no relative influence with the carbon plates, and, consequently, if left exposed to the acid, will be uselessly destroyed. In this case the outside of the cylinder is covered with a coating of copal varnish, and, in order to give it a body, it is mixed with charcoal or coal dust, but other matters may be used for the purpose.

The last part has reference to the production of electric light for the purposes of illuminating, by the application of two discs of carbon, in which a revolving motion is maintained by suitable apparatus, so arranged that their peripheries shall retain the same degree of proximity, thereby producing an uninterrupted light for a considerable length of time. For this purpose the electrodes should be of the purest carbon, to obtain which the patentee immerses them in a solution of nitric and muriatic acids for about twelve hours, and afterwards in a solution of fluoric acid, which will remove in a great measure the impurities contained.

Having described the nature of his invention, and the manner of carrying the same into effect, he wishes it to be understood that he does not confine himself to the detail given, so long as the peculiar character of either part of the invention be retained; but what he claims is:—First, the application of that description or quality of carbon obtained in the destructive distillation of coal and other matters such as are used in the manufacture of carburetted hydrogen gas, as one of the elements of an electric pile, and also the employment of carbon, moulded and subjected to pressure, and manufactured as described. Also the electrotyping the ends of carbon used as elements in electric piles. Also the connecting of carbon elements of an electric pile with other elements used, by soldering or by any other permanent fixture.

Secondly, the application of two discs of carbon as electrodes, that they shall (when they have completed a revolution) be caused by the mechanism to approach each other, and by that means obtain a continuous light of electricity.

Miscellaneous News.

Hydrocarbon Gas.—We understand that Mr. White, the patentee of this system, is constructing an experimental apparatus on a large scale in Belfast, under the patronage of the lighting and improvement commissioners. We may thus hope for an early solution of the question of the practicability of making gas from coal tar, and other carbonaceous liquids.

Alarming Fire at the Dover Gas Works.—About twenty minutes before six o'clock of January 19th the sky was illumined by a terrific flare of light, which was found to proceed from the Dover Gas Station. Within ten minutes of the alarm No. 1 of the Corporation engines was on the spot, closely followed by No. 2, and the engine from the Heights, under the direction of Sergeant-major Kent, and fully manned by a large body of the Royal Artillery, who are ever found ready on such disastrous occasions to render their able assistance. On the arrival of the engines it was intimated that their services would not be required, as, from the flames being confined to an escape of gas, ample means were at hand to arrest the progress of the fire. The flames, however, continuing with unabated fury for nearly half an hour, and having communicated to the retort-house, the hose of one of the engines was passed over the walls of the works, and, operating upon the spreading fire, speedily extinguished the flames in that quarter, and a subsiding of all further fear of danger soon followed. On an inquiry as to the origin of the fire, we found it to have been occasioned while turning the valve which communicates between the two gasholders. The valve, it appears, works by a crank, and in turning it, when half open, some impediment occurred, when the rush of gas from the aperture ignited from a lamp which was burning close by: the heat was so intense that the lead melted from one of the pipes leading from one of the purifiers, which also became ignited, and caused a most terrific glare, illumining the sky, the reflection of which over the town caused an immense concourse to assemble in a short period, the majority of whom appeared very cautious of approaching too near the premises for fear of the reported "terrific explosion." In less than an hour the flames were entirely subdued, and too much praise cannot be given to Mr. Kirkham, the engineer of the works, for the very judicious means employed; nor to his men, for the alacrity with which they executed his orders, many of whom rushed close to the flames, the heat from which was intense, for the purpose of filling the pipes with water. The town on the 19th was in a state of total darkness till the rising of the moon; but we hear the damage to the works is so trifling that the lamps were lighted on the evening of the 20th.

Destructive Fire at the Edinburgh Gas Works.—An explosion startled the inhabitants of Edinburgh on Thursday, Jan. 25. An intense vibration of the earth shook the houses near the Canongate; the inmates were in some cases thrown down, and the windows broken. The cause of the disaster was soon ascertained, and the attention of the crowds who thronged to the spot was drawn to a sheet of bright flame, arising from the gasholder of the Edinburgh Gas Company, which told too truly that the immense quantity of gas which it contained had, by some means, caught fire. In another moment the whole was one sheet of flame. The crowds lined the Calton-hill, Regent-road, and the adjoining points from which a view could be obtained, forming, as it were, an immense amphitheatre in the distance. The fire continued to blaze with great fury until gradually, as the gas was consumed, the gasholder became immersed in the tank amongst the water beneath, and the conflagration was ultimately extinguished by means of wet blankets and coarse sacking being spread over the shattered remains of the gasholder. The mysterious part of the matter is by what means the gas in the holder became ignited. There were in the gas-holder at the time nearly 300,000 cubic feet of gas, the greater portion of which would, of course, be consumed. The total damage was estimated at about £20,000.

Share List.

THE PRICES QUOTED ARE THOSE AT WHICH THE LAST SALES HAVE BEEN MADE.

The Companies whose names are printed in italic type are incorporated by Act of Parliament.

Number of Shares issued.	Amount per Share	Name of Company.	Amount paid up per Share	Dividend per Cent. per Ann.	Price.
	£	**ENGLAND.**	£ s. d	£ s. d	£ s. d
		Abergavenny			
		Aberystwith			
		Abingdon			
		Accrington £5500		5 0 0	
		Alfreton			
		Alston Moor			
		Alton			
800	5	Altrincham	5 0 0		
350	10	Andover	10 0 0	5 0 0	10 0 0
		Appleby			
		Ashburton			
		Ashby-de-la-Zouch			
		Ashford, Kent			
		Ashton-under-Line £42,500		13 4 0	
		Atherstone			
		Axminster			
225	20	Aylesbury	20 0 0	5 0 0	20 0 0
		Bacup, Yorkshire			
		Bakewell			
		Baldock			
		Banbury			
		Bangor			
500	5	Barking, Essex	4 10 0	5 11 0	5 0 0
250	10	Barnard Castle	10 0 0	5 10 0	10 15 0
		Barnet			
		Barnsley £6000		9 0 0	
100	20	Barnstaple	20 0 0	10 0 0	25 0 0
120	25	Basingstoke	25 0 0	8 0 0	28 0 0
2400	20	*Bath*	16 0 0	10 0 0	21 to 23
		Battle £2000		6 0 0	
		Bawtry			
		Beccles, Bungay, and Lowestoft			
		Bedford			
		Bedale, Yorkshire			
		Belper			
		Beminster			
		Berwick-on-Tweed			
		Beverley			
		Bewdley			
		Bideford			
		Biggleswade			
		Bicester			
		Bilston £25,000			
		Billericay			
		Bingley			
		Birkenhead and Claughton £56553	34 0 0	3 7 6	31 to 33
2400	50	*Birmingham and Staffordshire*	50 0 0	8 0 0	60 to 62
	25	*Ditto*, new shares	7 10 0	8 0 0	10 to 11
704	75	Birmingham	75 0 0	6 13 4	100 to 105
		Bishop's Auckland			
		Bishop's Stortford			
		Bishop Wearmth.			
		Blackburn £24,000		8 0 0	
		Blandford			
		Blythe			
		Bodmin			
		Bolton £49,500		9 0 0	
		Boroughbridge			
		Boston £8000		6 0 0	
200	10	Bourn	10 0 0	5 0 0	
		Bradford, Wilts			
		Bradford, Yorksh. £45,000		10 0 0	
		Brampton, Cumb.			
		Brandon, Suffolk			
		Brecon			
		Brierly Hill			
2250	20	*Brighton*	20 0 0	5 0 0	16 to 16 10
1125	20	,, new shares	16 0 0	5 0 0	
		Brighton and Hove £50,276			
4250	20	*Bristol*	20 0 0	10 0 0	37 to 39
1630	25	*Bristol and Clifton*	25 0 0	6 0 0	25 0 0
		Brixham			
		Braintree			
600	50	*Brentford*	50 0 0	6 0 0	46 to 48
	25	,, new shares	8 0 0	6 0 0	7 to 8
		Brentwood			
		Bridgnorth			
		Bridgwater £6000		5 0 0	
		Bridlington			
		Bridport			
		Brigg			
		Broadstairs			
		Bromley, Kent			
		Bromsgrove			
		Bruton			
100	25	Buckingham	25 0 0	5 0 0	25 0 0
		Bungay (see Beccles)			
		Burnley £19,946			
		Bursiem			
		Burton-on-Trent			
		Bury St. Edmund's			
		Bury, Lancashire £6570			
		Buxton			
280	10	Bideford	10 0 0	6 0 0	10 10 0
120	10	Bruton, Somerset	10 0 0	4 0 0	8 0 0
		Calne, Wilts			
		Camborne			
		Cambridge £32,000		7 0 0	
240	50	*Canterbury* Gas and Water	50 0 0	6 0 0	55 0 0
240	25	*Ditto*, second issue	25 0 0	6 0 0	25 0 0
		Cardiff £10,500		7 10 0	
		Carlisle £9000		8 0 0	
		Carmarthen			
		Carnarvon			
		Chapel on the Frith			
		Chard			
		Chatham (see Rochester)			
		Chatteris			
		Cheadle			
		Chelmsford			
		Cheltenham £17,242 10s.		8 10 0	
		Chepstow			
		Chertsey			
		Chesham, Bucks			
		Chester			
		Chesterfield £12,023 14s. 1d.			
240	25	Chichester	25 0 0	6 0 0	30 0 0
		Chippenham			
		Chipping Norton			
		Chorley			
		Cirencester			
		Clare			
		Clifton (Bristol and Clifton)			
		Cleckheaton, York.			
		Clitheroe			
		Cockermouth			
		Colchester			
		Colne, Lancashire			
		Coleb.ook Dale, Salop			
		Coleford, Gloster			
		Coggeshall			
		Congleton £5000		7 10 0	
800	25	*Coventry*	25 0 0	5 0 0	22 0 0
		Cowes			
		Cranbourn			
		Crewkerne			
		Croydon			
		Cranbrook £1900		5 0 0	
		Crediton			
		Crewe, Cheshire			
		Darlaston			
		Darlington			
250	20	Dartford	20 0 0	7 10 0	27 0 0
		Dartmouth			
125	20	Daventry	20 0 0	6 0 0	24 8 0
500	6	Denbigh	6 0 0	5 0 0	6 0 0
820	10	Deptford, Bermondsey, and Rotherhithe	10 0 0	5 0 0	
		Derby £16,250		7 10 0	
90	20	Dereham (East)	20 0 0	4 10 0	
1000	5	*Dewsbury*	5 0 0	7 10 0	8 12 6
		Devizes			
4000	5	*Devonport*	5 0 0	4 0 0	5 14 0
		Diss			
		Doncaster			
280	25	Dorchester	25 0 0	5 0 0	25 0 0
		Dorking			
		Douglas, Isle of M.			
220	50	*Dover*	50 0 0	7 0 0	62 0 0
		Downham			
		Driffield			
		Droitwich			
600	20	*Dudley*	20 0 0	3 0 0	16 to 18
		Dunmow			
		Dunstable			
		Durham			
276	9	Dursley, Gloster	9 0 0	5 10 0	8 0 0
		Elland			
		Ellesmere			
300	19	Epsom	19 0 0		
		Evesham			
		Exeter £40,000		8 0 0	
		Exmouth			
		Fakenham			
		Falmouth			
		Fareham			
120	25	Farnham	25 0 0	10 0 0	42 0 0
		Farringdon			
		Farsley			
		Faversham			
		Fleetwood			
		Folkestone			
		Frome			
		Gainsborough			
		Gillingham, Dorset			
		Glastonbury			
		Glossop £6000		7 0 0	
		Gloucester £24,600		7 10 0	
		Godalming			
		Gosport			
		Grantham			
		Gravesend			
1000	10	*Great Grimsby*	6 10 0	8 0 0	8 5 0
		Guildford			
		Guisborough			
		Hadleigh			
		Hales Owen			
300	6	Halesworth	6 0 0	7 10 0	5 10 0
		Halifax £15,000		8 0 0	
		Halstead			
		Hanley			
		Harleston			
		Harrogate £10,000			
		Hartlepool £7835		7 0 0	
		Haslingden, Lansh			
330	50	Hastings and St. Leonard's	50 0 0	6 0 0	60 0 0
		Haverfordwest			
		Haworth, Yorks.			
		Helstone			
		Hemel Hempstead			
300	10	Henley-on-Thams.	10 0 0		
		Hereford £5300		4 0 0	
7000	50	Herne Bay	10 0 0	7 0 0	12 0 0
270	10	Hexham			
		Heywood £10,000		7 10 0	
230	10	Hinckley	10 0 0	5 0 0	7 0 0
		Hindley, Lancash.			
		Hitchen			
		Hythe			
		Holbeach			
		Holmfirth £8325		6 0 0	
		Holyhead			
		Holywell (see British Provincial)			
		Honiton			
		Horncastle			
		Houghton-le-Sprg.			
		Horsham			
		Howden			
		Hull, Sculcoats (see British Provin.)			
		Hull, Broadley-st. £11,712. 10s.		8 0 0	
		Hungerford			
		Huntingdon			
		Huddersfield			
520	5	High Wycombe	5 0 0		5 0 0
		Hyde, Cheshire			
		Ilminster			
		Ilford			
		Ilfracombe			
		Ironbridge			
1400	10	*Ipswich*	10 0 0	8 0 0	15 0 0
1500	10	,, new shares	5 0 0	8 0 0	
800	25	*Isle of Thanet* (Ramsgate&Mar.)	20 0 0	5 0 0	25 0 0
		Kendal £7600		7 10 0	
		Keswick			
100	25	Kettering	25 0 0	5 0 0	25 0 0
		Kiddermins. £8000		5 0 0	
		King's Langley			
		Kington, Hereford			
		Knutsford			
		Llanelly			
		Launceston			
		Leamington Priors £20,000		6 0 0	
		Ledbury			
		Leeds Old Comp. old stk., £60,300		10 0 0	
		new ,, £11,527		6 0 0	
		Leeds New Comp.			
		Leek			
		Leicester		7 0 0	
		Leigh			
125	20	Leighton Buzzard	20 0 0	5 0 0	
		Leominster			
		Liskeard			
330	25	Lewes	25 0 0	5 0 0	23 0 0
		Lincoln £8000		10 0 0	
		Leyland, Lancash.			
		Lichfield			
		Liverpool United	100 0 0	5 0 0	146 to 152
		,, ½ sh.	25 0 0	1 1 8	37½ to 38½
		Llandaff			
		London Comps.—			
		British	18 0-0	5 11 1	13 to 15
		,, debentures		4 0 0	
5000	20	,, Prov.—(Ayr, Clonmel, Gloucester, Holywell, Hull, Norwich, Stoke, Trowbridg)	20 0 0	7 0 0	19 to 20
		,, Prov., new	3 0 0	7 0 0	2½ to 3
	25	*Commercial*	25 0 0	5 10 0	25 to 26
	25	,, new shres	10 0 0	5 10 0	pr. to ½pm.
	25	,, ,,	2 10 0	5 10 0	pr. to ½pm.
12,000	50	*Chartered*	50 0 0	6 0 0	48 to 49
6000	50	,, new shares	10 0 0	6 0 0	9¾ to 9¾
1000	100	*City of London*	100 0 0	10 0 0	240 0 0
1000	100	,, new shares	75 0 0	10 0 0	210 0 0
4000	50	*Equitable*	50 0 0	4 10 0	32 0 0
10,000	20	European—(Amiens, Boulogne, Caen, Havre, Nantes, and Rouen)	20 0 0		10 to 11
8000	50	*Impl. Continental*—(Amsterdam, Aix-la-Chapelle Antwerp, Berlin, Bordeaux, Brussels, Cologne, Frankft., Ghent, Haarlem Hanover, Lille, Marseilles, Rotterdam, Toulouse, Vienna)	42 0 0		35 to 37
		,, new shares	38 0 0		39 to 41
	50	,, third issue	42 10 0		52 to 55
10,000	50	*Imperial*	50 0 0	6 0 0	64 to 66
		,, debentures			
4000	40	*Independent*	40 0 0	6 0 0	60 to 62
3000	50	*London*	50 0 0		10 to 20
3000	50	,, preference	50 0 0		20 to 30
9000	50	*Phœnix*	47 0 0	5 0 0	30 0 0
320	50	*Poplar*	50 0 0	4 0 0	28 to 30
1600	100	*Ratcliff*	90 0 0	5 0 0	72 to 75
4000	25	*South Metrop.*	25 0 0	6 0 0	21 to 23
9000	50	United General—(Cork, Dublin, Limer., Waterf.)	50 0 0	2 10	12 10 0
		Western			
		Longport			

Number of Shares issued.	Amount per Share	Name of Company.	Amount paid up per Share	Dividend per Cent. per Ann.	Price.
	£		£ s. d	£ s. d	£ s. d
		Lostwithiel			
		Loughborough			
		Louth £6000		7 10	
		Lowestoft (see Beccles)			
611	5	Ludlow Union	5 0 0	6 0 0	5 0 0
		Luton			
		Lyme Regis			
		Lymington			
		Lynn			
		Malmesbury			
		Macclesfield £20,000		4 13 5	
		Maidenhead			
250	50	Maidstone	50 0 0	10 0 0	90 0 0
		Maldon			
		Marlborough			
		Matton			
		Manningtree			
		Mansfield £5000		10 0 0	
		March			
		Margate (see Isle of Thanet)			
132	25	Market Harboro'	25 0 0	6 0 0	30 0 0
		Market Raisin			
		Market Weighton			
		Marlow			
		Marypo.t			
		Melksham			
		Melton Mowbray			
		Merthyr Tydvil			
		Mere			
		Middleton £5000			
		Midsummer Norton			
		Middlewich			
		Middlesboro'			
		Mildenhall			
		Milford Haven			
		Minchinhampton			
		Mold			
700	10	Monmouth Gas and Water	10 0 0	4 0 0	
		Monk Wearmouth			
		Moreton in the Marsh			
		Morpeth			
		Nantwich			
		Neath			
		Newark £5000		10 0 0	
		Newbury			
13,000	5	Newcastle & Gateshead Union	5 0 0	10 0 0	6 12 6
		Newcastle-under-Lyne £5000		5 0 0	
600	5	Newmarket	5 0 0	6 0 0	5 0 0
		New Mills & Hayfield £2115			
		Newport, Monmouthshire			
320	50	Newport, Isle of Wight	33 0 0	4 0 0	22 to 24
		Newport Pagnell			
		Newport, Salop			
		Newton Abbot			
		Newton, Lancash.			
		Northallerton			
		North Walsham			
		Northampton			
		Northwich			
		Norwich (see British Provincial)			
		Nottingham £42,500		10 0 0	
		Nuneaton			
		Oakham			
		Oakhampton			
		Oldham			
		Ongar			
		Ormskirk			
		Otley, Yorkshire			
		Oundle			
		Oxford £18,000		9 10 0	
		Over Darwen £8000		5 0 0	
		Pately Bridge, Yorkshire			
		Pembroke			
250	20	Penrith	15 0 0	6 10 0	21 0 0
		Penryn			
		Penzance			
200	10	Petworth	10 0 0	9 10 0	14 10 0
		Pickering			
3000	10	*Plymouth & Stonehouse*	10 0 0	6 0 0	11 0 0
		Pocklington			
		Pontefract			
400	10	Poole	10 0 0	5 0 0	10 0 0
600	50	*Portsea Island*	53 0 0	5 0 0	47 to 49
400	10	Prescott	9 0 0	4 13 4	7 0 0
		Preston £52,500		10 0 0	
		Pontypool			
		Pudsey			
		Radcliff and Pilkington £9000		4 12 10	
		Ramsgate (see Isle of Thanet)			
		Reading £10,190		3 0 0	
		Reading Union			
		Redditch			
		Redruth			
		Reigate			
		Retford (East)			
		Richmond, Surrey			
		Ripon			
		Rochester and Chatham £14,000		6 0 0	
		Rochford			
		Rockingham			
		Ross			
		Rotherham £4000		10 0 0	
		Royston			
		Rugby			
		Rugeley			
		Runcorn			
		Ryde			
		Rye			
		Romsey			
		Saddleworth			
		Saffron Walden	20 0 0	3 15 0	19 0 0
		St. Austel			
		St. Colomb			
		St. Helen's £7200		5 0 0	
		St. Ives, Huntingd.			
		St. Ives, Cornwall			
		St. Neot's			
		Salisbury			
		Scarborough			
		Selby			
		Settle			
		Sevenoaks	10 0 0	5 0 0	10 0 0
		Shaftesbury			
		Sheffield United	24 0 0	8 6 4	32 0 0
		Shelton, Potteries			
		Shepton Mallet			
		Sherborne			
		Shields, North (Tynemouth)	5 0 0	3 0 0	5 0 0
		Shields (South)			
		Shiffnal, Salop			
		Shipley			
		Shipston-on-Stour			
		Shrewsbury £10,000		7 0 0	
		Skipton			
		Sleaford			
		South Molton			
		Southampton			
		Sowerby, Yorksh.			
		Stokesly			
		Stafford £10,000			
		Staines and Egham			
		Staley Bridge £15,000		10 0 0	
		Stamford £11,250			
		Stockport £34,200		7 11 0	
		Stockton-on-Tees £3600		8 0 0	
		Stoke, Staffordsh. (see British Provincial)			
		Stoney Stratford			
		Stourbridge			
		Stowmarket			
		Stratford-on-Avon			
		Stroud			
		Swaffham	10 0 0	5 0 0	5 10 0
		Swansea £9000			
		Sudbury			
		Sunderland, old			
		,, new			
		Swindon			
		Taunton	5 0 0		2 10 0
		Tadcaster			
		Tamworth			
		Tavistock			
		Teignmouth			
		Tenbury			
		Tenby			
		Tenterden £2000		2 10 0	
		Tetbury, Gloster			
		Tewkesbury			
		Thame			
		Thetford			
		Thirsk			
		Thorne			
		Tiverton			
		Todmorden	3 0 6		
		Tolcross, N.B.			
		Torquay			
		Torrington, Devon			
		Totnes			
		Tottenham		6 0 0	
		Towcester			
		Trowbridge (see British Provinl.)			
		Truro	50 0 0	2 0 0	
		Tunbridge			
		Tunbridge Wells			
		Uppingham			
		Uttoxeter			
		Uxbridge			
		Wakefield, old capl	25 0 0	8 0 0	24 0 0
		,, new ,,	5 0 0	8 0 0	4 16 0
		Walsall			
		Wandsworth			
		Warrington £18000		10 0 0	
		Wareham	10 0 0	3 10 0	8 0 0
		Warminster	25 0 0	5 0 0	27 0 0
		Warwick £15,000		6 0 0	
		Watford			
		Welchpool, Mntgy.			
		Wellington, Salop			
		Wellington, Smrst.			
		Wells, Smrst. £4000		6 0 0	
		Westbury			
		Weston-sup.-Mare			
		West Ham	5 0 0	4 0 0	5 0 0
		Whitley			
		Whitehaven			
		Wigan £10,160		5 0 0	
		Willenhall			
		Winslow			
		Wimborne Minster	10 0 0		
		Wincanton			
		Winchester			
		Windsor			
		Wisbeach			
		Witham			
		Witney			
		Wolverhampton, £11,000		15 0 0	
		Woburn			
		Wokingham			
		Woodbridge			
		Wotton-un.-Edge			
		Worcester			
		Workington			
		Worksop			
		Wirksworth			
		Worthing			
		Wortley, Yorksh.			
		Wrexham			
		Woolwich			
		Woolwich Consms.			
300	10	Wallingford	10 0 0	2 10 0	8 0 0
		Wymondham			
795	20	Yarmouth	20 0 0		15 to 16
		Yeovil			
		York Untd. £55,000			
		SCOTLAND.			
		Aberdeen			
		Airdrie			
		Alloa			
		Anstruther			
		Ardrossan, nr. Saltcoats			
550	20	Arbroath	20 0 0	7 10 0	27 10 0
		Auchterarder			
		Auchtermuchty			
		Ayr, old (see Brit. Provincial)			
		Ditto, new			
		Banff			
		Bathgate			
		Beith			
		Boggar			
250	6	Borrowstowness	6 0 0	5 0 0	8 0 0
		Brechin			
		Broughty Ferry, near Dundee			
		Burntisland			
		Campbelton			
		Clackmannan, near Alloa			
		Coatbridge			
		Coldstream			
		Collinsburgh			
		Crieff			
		Crail, Fife			
		Cumbernauld, near Glasgow			
600	5	Cupar Angus	5 0 0	6 0 0	5 10 0
250	10	Cupar Fife	10 0 0	7 10 0	14 0 0
		Dalkeith			
		Dingwall			
		Dumbarton			
400	20	Dumfries	14 0 0	5 0 0	20 0 0
		Dunbar			
		Dunblane			
		Dundee, old			
		,, new			
860	10	Dunfermline	10 0 0	6 0 0	12 12 0
		Dunkeld			
		Dunse			
		Dysart			
6000	25	*Edinburgh Gas Co.*	25 0 0	10 0 0	45 0 0
		,, *and Leith Co.* £150,000		6 10 0	
		Elie			
		Elgin			
		Falkirk, old			
		,, new			
		Falkland			
		Forfar			
		Fort William			
		Fraserburgh			
		Galashiels			
		Girvan			
		Glasgow £122,500		5 0 0	
15000	10	*Glasgow City and Suburban*	9 0 0	7 10 0	9 0 0
		Grangemouth			
		Greenock			
		Haddington			
		Hamilton			
		Hawick			
		Helensburgh			
		Inverary			
		Inverkeithing			
1200	10	*Inverness Gas and Water*	10 0 0	8 0 0	15 0 0
2400	5	,, new shares	1 5 0	8 0 0	2 5 0
		Irvine			
		Jedburgh			
		Keith			
		Kelso			
		Kilmarnock			
		Kinghorn			
		Kinross			
		Kirkaldy			
320	5	Kirkcudbright	5 0 0	5 0 0	5 0 0
1000	3	Kirkintilloch, near Glasgow	3 0 0	5 0 0	3 0 0
		Kirkwall			
518	5	Kirriemuir	5 0 0	6 0 0	
		Lanark			
		Largo, near Leven			
		Largs			
		Lasswade, n. Edinburgh			
		Lauder			
		Leith			
		Lesmahago			
		Leven			
		Linlithgow			
		Linton, n. Nobleh.			
		Lochee, n. Dundee			
		Lochgilphead			
		Lochwinnock, near Paisley			
		Mauchline			
		Maxwell-town, n. Dumfries			
		Melrose			
718	2	Mid & East Calder	2 0 0		2 0 0
192	5	Moffat	5 0 0		
		Montrose			
		Musselburgh			

Number of Shares issued.	Amount per Share	Name of Company.	Amount paid up per Share	Dividend per Cent. per Ann.	Price.
	£		£ s. d	£ s. d	£ s. d
		Muirkirk			
		Nairn			
		Neilston, n. Glasg			
		Newburgh, Fife			
		Newton Stewart			
		North Berwick, n. Haddington			
		North Queensferry			
		Oban			
		Peebles			
800	25	Perth	25 0 0	1 4 0	22 10 0
		Peterhead			
		Pittenweem			
		Pollokshaws, near Glasgow			
		Port Glasgow			
		Portobello, near Edinburgh			
		Prestonpans			
		Renfrew, n. Paisley			
		Saltcoats			
		Selkirk			
		South Queensferry			
		St. Andrew's			
		Stewarton			
		Stirling, old			

Number of Shares issued.	Amount per Share	Name of Company.	Amount paid up per Share	Dividend per Cent. per Ann.	Price.
	£		£ s. d	£ s. d	£ s. d
		Stirling, new			
		Stonehaven			
		Stranraer			
		Strathaven, near Hamilton			
		Thurso			
		Tillicoultry, near Alloa			
		Torryburn, near Dunfermline			
800	1	Tranent	1 0 0		1 0 0
		Troon			
		Wick			
		Wigton			
		Wemyss		4½	
		IRELAND.			
300	10	Armagh	10 0 0	8 0 0	14 10 0
700	50	*Belfast*	50 0 0		
		Ballymena			
		Cashel			
		Carlow, new			
		Cork (see United General)			
		Coleraine			

Number of Shares issued.	Amount per Share	Name of Company.	Amount paid up per Share	Dividend per Cent. per Ann.	Price.
	£		£ s. d	£ s. d	£ s. d
		Clonmel (see British Provincial)			
		Drogheda			
		Dublin Consumers £190,000		7 0 0	
		Dublin Hibernian (see United Gen.)			
160	25	Dundalk	25 0 0		22 0 0
		Dungannon			
		Downpatrick			
		Galway			
400	10	Kilkenny	10 0 0	8 0 0	11 5 0
		Limerick (see United General)			
1725	5	Limerick Consumers	5 0 0	5 0 0	5 0 0
600	15	Londonderry	15 0 0	6 13 4	21 10 0
		Lisburn			
520	10	Lurgan	6 0 0	6 0 0	6 0 0
		Nenagh			
448	5	Newtownards	5 0 0	4 0 0	5 0 0
		Newry			
125	20	Portadown	13 0 0		
		Strabane			
		Sligo			
		Waterford			
		Wexford			

The Gas Works in the undermentioned towns belong to private individuals:—

Carlow, old. Deal. Ely. Goole. Hertford. Holt. Kingston-on-Thames. Lancaster. Oswestry. Peterborough St. Alban's. Sandwich. St. Helier's, Jersey. Sheerness. Sidmouth. Sittingbourne. St. Peter's Port, Guernsey. Spalding. Romford. Waltham Abbey. Ware. Wem. Weymouth. Whitchurch (Salop).

The Gas Works belong to the Corporations, or to Commissioners acting under special acts of Parliament, in the following towns:—

Keighly. Knaresborough. Manchester. Milton (Kent). Paisley. Rochdale. Rothesay. Richmond (Yorkshire). Salford. Wells (Norfolk).

We regret that our Share List should be still incomplete, and shall be glad to receive any information respecting companies the number of whose shares, and amount paid up, we have not been able to ascertain.

Price Current.

The following List of Prices is corrected by an eminent house in each trade up to the latest period:—

CASTINGS, per Ton.

Average Weight of Cast Iron Pipes, per Yard.

1½ in.	2 in.	2½ in.	3 in.	4 in.	5 in.	6 in.	7 in.	8 in.	9 in.	10 in.	12 in.
16	21	28	33	51	70	89	107	126	149	177	208 lbs.

	London. £ s. d.	Glasgow £ s. d.	Newcastle, £ s. d.	Wales. £ s. d.	Yorkshire, Derbyshire, and Staffordshire. £ s. d.
Pig Iron, No. 1.	3 7 6	2 12 6	3 0 0	3 15 0	3 10 0
1½ and 2 inches Socket Pipes	6 0 0	5 0 0	5 10 0	5 15 0	5 15 0
2½ and 3 do. do.	5 17 6	4 17 6	5 7 6	5 12 6	5 12 6
4 and 5 do. do.	5 15 0	4 15 0	5 5 0	5 10 0	5 10 0
5 inches and upwards do.	5 12 6	4 15 0	5 2 6	5 7 6	5 7 6
Extra for bends, branches, and connection	2 0 0	2 0 0	2 0 0	2 0 0	2 0 0
Retorts, 1st fusion	5 2 6	..	..	4 17 6	5 0 0
Do. 2nd fusion	5 7 6	4 10 0	4 17 6	5 5 0	5 5 0
Tank Plates, ⅜ thick and above	5 10 0	4 17 6	5 0 0	5 7 6	5 7 6
Do. less than ⅜	5 15 0	5 0 0	5 5 0	..	5 10 0
Plain Castings ex. models	5 15 0	5 0 0	5 5 0	5 10 0	5 10 0

WROUGHT IRON WORK, per Ton.

	London.		London.
Small Gasholders, in pieces,	£19 10 0	Screw Bolts, small	£30 0 0
Large do. do.	18 0 0	Do. large	24 0 0

COALS—NEWCASTLE.

		pr.ton.
Dean's Primrose, unscreened	5	9 pr.ton.
Eighton Moor	6	6 ,,
Felling Main	6	6 ,,
Hutt's Tanfield	6	6 ,,
Medomsley	6	0 ,,
New Tanfield	6	0 ,,
New Pelton	6	6 ,,
Peareth	6	6 ,,
Pelaw	6	3 ,,
Pelton	6	6 ,,
Ravensworth Pelaw	5	9 ,,
Ramsay's Cannel	15	0 pr.ton.
South Pelaw	6	6 ,,
South Pontop	6	6 ,,
Tyne Main	5	6 ,,

DERBYSHIRE.

Clay Cross	6	6 ,,
Deep Main	6	6 ,,
Jerries	6	6 ,,
New Birchwood	6	6 ,,
New Shipley	6	6 ,,
Sleight's	6	6 ,,
Soft Main	6	6 ,,

We trust to be able to make our next publication more perfect in this department by quoting the prices of coal from the Scotch, Lancashire, Staffordshire, & Welsh Collieries.

FIRE GOODS.

Best Fire Bricks, 60s. per thousand, at Newcastle.
Do. Clay, 12s. per ton do.

WROUGHT IRON TUBING, subject to Discount.

	2 inches.	1½ inch.	1¼ inch.	1 inch.	¾ inch.	½ inch.	⅜ inch.	¼ inch.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
Patent welded tubes, from 4 to 12 feet per foot	1 8	1 0	0 10	0 7	0 5	0 4½	0 3½	0 2½
Ditto „ 2 to 4 feet	One penny per foot extra.							
Ditto „ 6 inches to 18 inches each	3 0	2 0	1 9	1 3	1 0	0 9	0 7	0 6
Connecting pieces, or long screws „	3 6	2 3	2 0	1 6	1 2	0 11	0 9	0 8
Bends, wrought iron „	3 9	2 3	1 9	1 .0	0 10	0 8	0 7	0 6
Springs, wrought iron „	3 9	2 3	1 9	1 0	0 10	0 8	0 7	0 6
Elbows, wrought or cast „	3 9	2 3	1 9	1 0	0 10	0 8	0 7	0 6
Tees, wrought or cast „	4 0	2 6	2 0	1 6	1 1	0 10	0 8	0 7
Crosses, wrought or cast „	4 6	3 0	2 6	2 0	1 6	1 2	1 0	0 9
Iron cocks „	17 6	9 6	7 6	4 6	3 3	2 6	2 0	2 0
Ditto, with brass plug „	28 0	16 0	13 0	7 0	5 6	4 6	3 6	2 6
Diminishing sockets „	1 3	0 9	0 8	0 6	0 5	0 4	0 3	0 3
Plain sockets „	1 0	0 8	0 7	0 5	0 4	0 3	0 2	0 2
Caps, plugs, nipples, backnuts „	1 3	0 9	0 8	0 6	0 5	0 4	0 3	0 3
Flanches „	1 9	1 6	1 3	1 0	0 9			12 6
Syphons, 2 quart „	15 0	14 0	13 6	13 0	12 0			
Ditto 1 quart „	11 0	10 0	9 6	9 0	8 6			
Tongs or nippers each pair	9 0	7 0	6 6	5 6	4 9	4 6	3 6	2 3
Elbow burners per dozen	7 6	jet or batwing.						3 0
Straight burners „	6 0	ditto.						

Stocks, dies, and taps, for 2 inch, 1½ inch, and 1¼ inch tubing ..... £8 10s. 0d. per set.
Ditto, do. and do. „ 1 „ ¾ „ and ½ „ „ ..... 5 5 0 „
Ditto, do. and do. „ ⅝ „ 2-8 „ and ⅜ „ „ ..... 3 0 0 „

FREIGHTS, per Ton.

Coastwise—Newcastle.	s. d
Chatham & Roches.	8 0
Colchester & Maldon	7 0
Cork	10 6
Dartmouth	10 0
Devonport	10 0
Dover	7 0
Dublin	11 3
Exeter Quay	11 0

	s. d
Faversham	7 6
Folkestone	7 9
Hastings	9 0
Ipswich	6 6
Jersey	9 6
London	6 6
Lowestoft	6 0
Lynn	6 0
Limerick	14 6

	s. d
Margate	6 6
Newhaven	7 6
Portsmouth	9 0
Plymouth	11 0
Rye	8 6
Southampton	9 0
Totnes	9 0
Teignmouth	9 6
Weymouth	9 6

	s. d
Yarmouth	6 0
Foreign.	
Algiers	18 0
Amsterdam	10 0
Antwerp	10 0
Boulogne	9 0
Barcelona	17 0
Bordeaux	14 6
Calais	10 0

	s. d
Caen	12 0
Cadiz	8 0
Cette	14 0
Dieppe	10 0
Genoa	17 0
Hamburg	12 0
Havre	10 0
Honfleur	12 0
Leghorn	17 0

	s. d
Lisbon	9 0
Marseilles	14 0
Nantes	12 6
Naples	17 0
Rotterdam	7 0
Rouen	14 0
Toulon	16 0
Trieste	20 0
Venice	24 0